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Report of the Chief of the Forest Service, 1964

United States Department of Agriculture

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U.S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D.C., February 15, 1965.

HON. ORVILLE L. FREEMAN,
Secretary of Agriculture.

DEAR MR. SECRETARY:

Sending you this report is a special pleasure for me in this 60th anniversary year of the Forest Service. This summary of our activities in 1964 reflects the substantial progress in forestry that has marked the past decade or so. A comprehensive analysis of the nationwide forestry situation may be found in our new publication, "Timber Trends in the United States."

That appraisal makes clear that forestry leadership has been in the right direction. Protection, planting, research, and many other activities are paying off. However, the report underscores the fact that forestry measures must be intensified to meet future demands. Annual timber growth is now exceeding the harvest. But the declining supply of larger, high-grade trees and the overburden of low-grade timber are serious problems. There is no room for complacency as we move to meet the rising demands of all kinds that are being concentrated on the Nation's forest land.

The improved forestry situation does provide an opportunity to respond fully to President Johnson's call for a new, creative conservation. For example, we can give added emphasis to well-planned multiple uses of forest lands and resources. We can promote forest management practices that will help to beautify the countryside and contribute fully to the Great Society.

Sincerely yours,

Edward P. Cliff

EDWARD P. CLIFF,
Chief, Forest Service.

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This report covers calendar year activities unless otherwise identified. Records on a fiscal year basis are so reported. Mention of commercial companies, products, or services is solely for necessary historical identification and implies no endorsement.

The Forest Service, U.S. Department of Agriculture, is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

Issued June 1965

Report of the Chief of the Forest Service, 1964

Introduction—Highlights

This was a bright year for forestry in America. It was a bright year for natural resource conservation. We were on the move. And the American people can be proud of the direction and pace. In terms of accomplishments, general forestry progress, and promising new starts, 1964 was a remarkable year. Advances were notable in all three major areas of Forest Service work: Forestry Research, State and Private Cooperative Forestry, and National Forest Administration.

Our Research Posture Is Improved.—We have a stronger and more highly skilled group of scientists than ever before because of training efforts and recruiting of well-trained men. A number of new laboratories have been built and equipped. These provide modern facilities for efficient attack on pressing problems.

A major step was taken in the approval and appropriation for a $4 million expansion of the Forest Products Laboratory at Madison, Wis. This is the first major expansion since the main structure was built 32 years ago. It will modernize this central wood laboratory, providing new space and facilities that are critically needed. It will make possible new research projects with tools and processes unknown a few years ago.

The new structure will itself be a virtual display of some of the newer uses of wood—glued laminated wood arches, paper-overlaid and plastic-surfaced plywood, sandwich panels, wood finishes, adhesives, and preservatives—all direct outgrowths of the laboratory's research.

Timber Trends in the U.S., the new comprehensive survey and appraisal of the national timber situation, was published early in 1965. This shows that in volume of timber being grown we are doing very well. As of 1962, the Nation was growing annually about 60 percent more than was being cut. In sawtimber, growth exceeds annual cut by about 17 percent.

But this picture is not as rosy as the statistics seem to indicate. The increased growth volume of course is an encouraging trend. The increase, though, is mainly in smaller and less desirable trees, while the supply of larger, more desirable sawtimber continues to diminish. This means that efforts must be continued and stepped up to find more ways to use and market the smaller trees. Progress is being made in this direction.

Strong Beams From Little Pines will be the result if machinery now being developed at the Southern Forest Experiment Station is successful. A large quantity of 6- to 12-inch southern pines needs to be removed from growing stands. The aim of this new development is to have a series of connected operations in which the small green bolts will be fed into one end and a continuous laminated beam will emerge from the other end. It will feature slicing, finger jointing of the pieces, electronic gluing, and an almost instant drying process. There will be no sawing, no sawdust, and no slabs. Residues would become salable pulp chips.

If perfected, this operation could be another new industry for the South. And it would provide a market for surplus small pines that are too good for pulpwood and not big enough for high-quality sawtimber.

More Hardwoods Into Pulp.—Use of hardwoods in making paper is expanding rapidly, and is expected to be four times greater by the year 2000, as population and use of paper grows.

The "hardwood problem"—large supplies with little use or market—is on its way to a solution with the rising use of hardwoods for pulpwood.

The technological breakthrough in hardwood semichemical pulping, brought about by the Forest Products Laboratory, was stimulated at first by the abundance and low cost of hardwoods. Now the hardwoods have become indispensable in certain grades of paper ranging from corrugated container to book, magazine, and tissue papers.

This should be an economic boost to areas with large hardwood forests such as Appalachia, the Northeast, and the North Central States where the trend to more hardwood use likely will continue for the next 35 years.

New Process Can Eliminate Pulp Pollution.—The Forest Products Laboratory has further modified the semichemical pulping process to help eliminate stream pollutants. Recently demonstrated, the low-cost process recovered 90 percent of the pulping chemical with little drop in pulp yield.

Safer Insecticides.—Progress is being made in finding insect predators and in developing safer insecticides, which may soon eliminate the use of the more toxic chemicals. The use of insect viruses as natural insecticides is one of the most promising advances in the fight to control pests by biological means. Methods of mass producing some of the viruses are within reach, and this could result in their widespread use at a reasonable cost. In the near future viruses may be playing a major role in forest pest control.

In total, forestry research continues to lead the way in forestry progress and improved uses of wood. It not only is a big factor in going industrial progress, but can be a major weapon in the war on poverty.

Multiple Use Comes to Private Forests.—More and more woodland owners and consumers are learning that the forest is a reservoir of renewable resources—trees and many other products. The American consumer is showing increasing interest in the many products and services of the forest. In addition to timber, there are recreation, water, wildlife, and special forest products. The woodland owner, in response to consumer demand, is asking for more technical guidance in the management of his forest for profit under multiple use and sustained yield principles. And more private owners of woodlands are diversifying into other marketable products while their timber grows.

Wood-based industries and better forestry on private lands are making substantial contributions to Rural Areas Development. More productive private forests and more diversification through multiple use will be big factors in improving rural America, abolishing poverty, and building more prosperous communities.

Outdoor Recreation.—Many forest owners are cashing in on a now crop: the annual $20 million boom in outdoor recreation.

A farmer in Ohio guarantees hunters two pheasants a day and the use of trained dogs for $15.

Meals, use of a Jeep, and hunting equipment are sold by another woodland owner.

Hayrides and buggy rides through the forest are being marketed. So are berrypicking rights.

Private club memberships are offered by some farmers for $100 per family per season. Facilities provided include farm pond, washroom, and picnic area.

Campsites in a wooded field are rented for $2 a day in Florida.

Toboggan runs and ski slides pay off for some woodland owners.

Wooded ravines and waste land have been converted to good swimming and boating areas, with a resulting profit to the landowners.

More Than a Billion Trees Planted.—On all classes of land, 1,353,000 acres were planted in fiscal year 1964, including 184,000 acres direct seeded. Some 950 million tree seedlings and nearly 70 tons of seed were needed to accomplish this task. Planting on private lands accounted for 73 percent of this, and the remainder was on State and Federal lands.

Among the States, Florida led with the most planting: 128,000 acres. Ranking next in order were Georgia, Mississippi, Alabama, and Virginia.

Another Record Timber Harvest.—From the 154 National Forests 11 billion board feet of timber was harvested in fiscal year 1964, an increase of a billion board feet over the 1963 harvest. This amounts to about one-third of all sawtimber cut in the country during the year.

Receipts from timber came to $128 million, up $10.6 million over 1963 receipts.

Cash Receipts from all National Forest sources during the fiscal year amounted to $135,700,000—up $11 million over 1963. This included, in addition to timber receipts, income from grazing fees and other uses of the forests. Twenty-five percent of receipts is paid to the States for schools and roads within counties where the receipts originated.

A New Timber Sale Contract was developed this year through negotiations between the Forest Service and the timber industry. It represents substantial progress in Forest Service-industry relations.

Major revisions of the old contract include reorganizing its form, standardizing provisions and eliminating subjective performance requirements of timber purchasers, changing pricing procedures and adjusting volume estimates under certain conditions, providing for road construction credits, clarifying purchaser obligations for fire suppression costs, and providing for termination of the contract upon application of the purchaser in the event of catastrophe to the timber. The yearlong negotiations produced a document which should be simpler and easier to work with.

Recreation Visits to National Forests increased to nearly 134 million, some 11 million more than the figure for 1963.

Man-Caused Fires Down.—Despite severe fire weather in the West which resulted in several big fires, the overall fire situation on National Forests was good this year. Since 1957 number of man-caused fires on National Forests has been steadily increasing as public use of these lands continues to rise. For the first year since 1957, man-caused fires were down in 1964 to 5,097 fires, compared with 6,269 in 1963.

The big fires in the central Rockies and California marred what would have been an especially good year in forest fire control. Even so, number of fires and acreage burned in 1964 were below the 5-year average.

Response to Major Emergencies.—This year the Forest Service was called on to respond to an unusual number of natural disasters. And the way our people respond to such occasions, beyond the call of duty, is always a source of pride. Na-

tional Forest lands, roads, and bridges were dealt costly blows by floods in Montana-Idaho in June, the California-Oregon floods at Christmas, the Alaska earthquake, and the mammoth Coyote Fire on the edge of Santa Barbara, Calif.

Typical of the response was the emergency treatment to the 70,000 acres of critical watershed lands burned over in the Coyote Fire. It was a rush here to reseed and repair the watershed ahead of fall rains that could have brought greater damage from floods. More than 40 construction workers and engineers worked 12 hours a day for 2 months. By December 11, just ahead of the rains, 69,000 acres had been seeded and other repair work done to win the race against time.

Cooperation Between Departments.—On August 13, 1964, the Secretaries of the Army and Agriculture signed an agreement for cooperation in planning, development, and management of water resource projects associated with the National Forest System.

Under the agreement, the Army Corps of Engineers and the Forest Service work closely together in planning water and related land resource projects to be constructed by the Corps of Engineers that are within or partly within National Forests. A land interchange order with a memorandum of understanding will be worked out for each project.

The first action under this agreement occurred when the President's Recreation Advisory Council, with Secretary Freeman as Chairman, agreed to place administration of Federal lands around the Allegheny Reservoir in Pennsylvania under Forest Service jurisdiction. This was a pioneer decision resulting in greater public service at less cost by placing management of this important recreation area under a single agency.

The Accelerated Public Works Program (APW), which began in October of 1962, was largely terminated in 1964 with the awarding of the last contracts. The 2-year work program brought needed improvements on 106 National Forests and provided 86,000 man-months of employment to the unemployed in local forest areas. This is equivalent to a year's work for 7,166 men.

The Forest Service received $60.2 million to finance the projects. Among major accomplishments were: 6,967 family camp and picnic units constructed; 19,300 acres planted to trees; 203,000 acres given timber stand improvement; erosion control applied to 36,000 acres; 4,300 acres of range revegetated; and 918 buildings constructed.

Job Corps Conservation Centers, a part of the Office of Economic Opportunity and the administration's drive against poverty, became a new Forest Service responsibility during the year. Much work—planning, selection of center personnel, and training effort—went into this program. While no centers were opened in 1964, 58 sites were selected in 31 States for the building of Job Corps Centers on National Forests. Construction was underway. Some of these will be in operation early in 1965.

The Forest Service views Job Corps Conservation Centers as another great opportunity to serve the Nation; these centers will offer less-privileged youth a chance at a better life, and at the same time help improve forests and other natural resources.

The National Wilderness Preservation System, approved by Congress and the President, is a landmark in conservation progress. Passage of this law represented national approval of a unique conservation concept pioneered by the Forest Service 40 years ago and built up through the years since. The initial system comprises 9.1 million acres of National Forest wilderness, still to be administered by the Forest Service. Provisions are made for including additional Federal lands later, after study and approval by Congress. This action gives the added protection and permanence of Federal law to these lands and assures future generations that they will see, have, and hold some of wild America just as it was when our forefathers came.

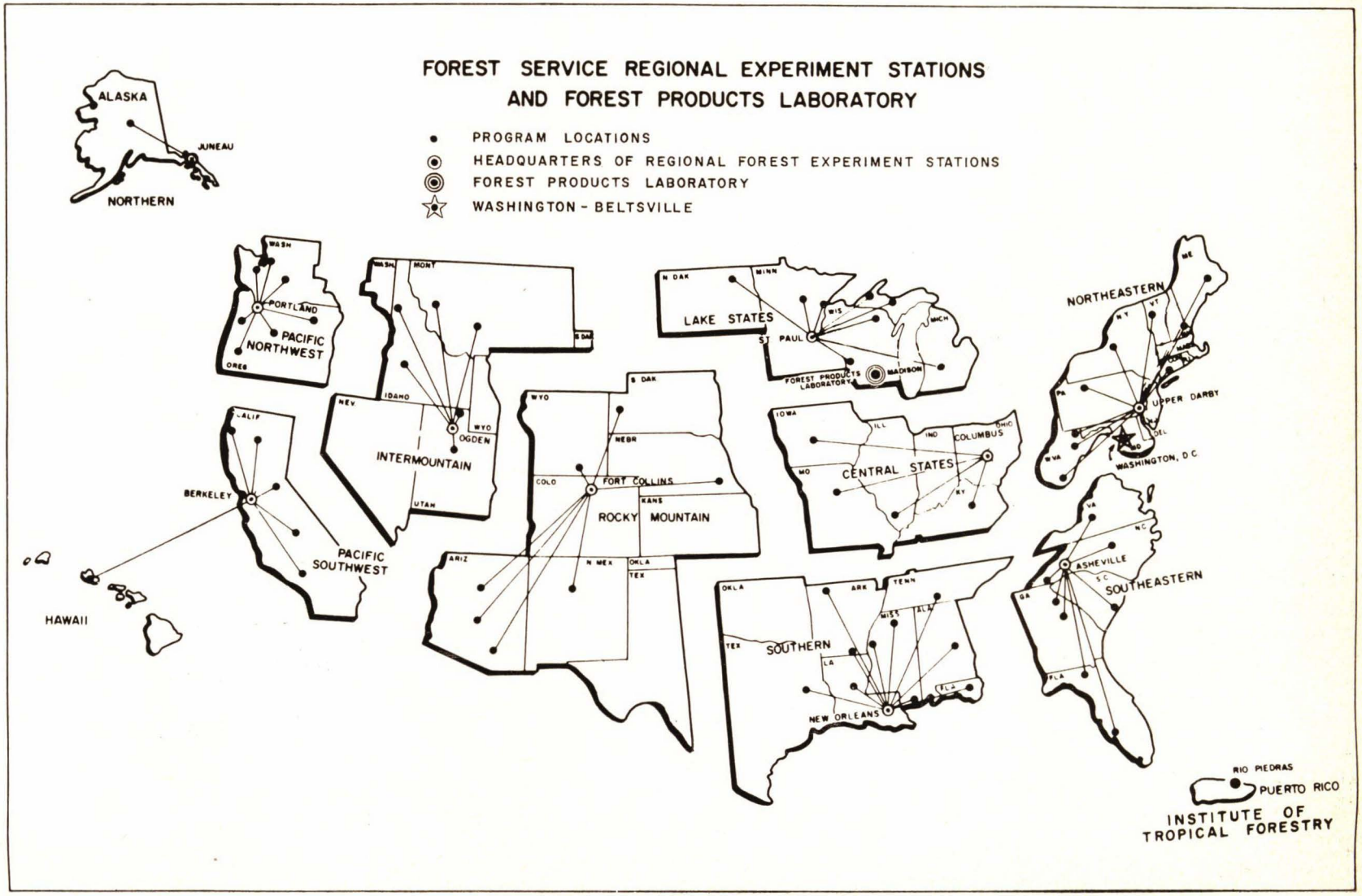
The Land and Water Conservation Fund Act is another landmark in the advancement of nationwide conservation. It assures that money spent by the public on and for recreation will be earmarked in a special fund to be put back into outdoor recreation. It will enable the State and Federal Governments to plan and develop the outdoor recreation facilities the public will need.

Resources of the National Forests—the wood, water, recreation, range, and wildlife—long have been in the service of a growing America; they are being further mobilized to aid the war on poverty and build a better society.

Toward the Great Society.—President Johnson said the Great Society

> is a place where man can renew contact with nature. It is a place which honors creation for its own sake and for what it adds to the understanding of the race. It is a place where men are more concerned with the quality of their goals than the quantity of their goods.

For three centuries this Nation's natural resources, including its fabulous forests, have been major building blocks of our society. Forests and the industry they nourish are today a major part of our economic structure and prosperity. Our forests helped build a mighty Nation and still help sustain it. Our forests and parks with their abundance of wood, scenic beauty, and recreational and cultural opportunities will be a cornerstone in the Great Society.


FOREST SERVICE REGIONAL EXPERIMENT STATIONS
AND FOREST PRODUCTS LABORATORY
PROGRAM LOCATIONS
HEADQUARTERS OF REGIONAL FOREST EXPERIMENT STATIONS
FOREST PRODUCTS LABORATORY
WASHINGTON - BELTSVILLE
ALASKA
JUNEAU
NORTHERN
PACIFIC NORTHWEST
PORTLAND
INTERMOUNTAIN
OGDEN
LAKE STATES
ST PAUL
FOREST PRODUCTS LABORATORY
MADISON
NORTHEASTERN
UPPER DARBY
WASHINGTON, D.C.
CENTRAL STATES
COLUMBUS
ROCKY MOUNTAIN
FORT COLLINS
PACIFIC SOUTHWEST
BERKELEY
HAWAII
SOUTHERN
NEW ORLEANS
SOUTHEASTERN
ASHEVILLE
RIO PIEDRAS
PUERTO RICO
INSTITUTE OF TROPICAL FORESTRY

FORESTRY RESEARCH is carried on by the Forest Service at its 10 regional Experiment Stations, the national Forest Products Laboratory, the Washington Office, the Institute of Tropical Forestry, and with cooperating universities. Scientists study the growth and harvesting of timber; protection of forests from fire, insects, and disease; management of rangelands and wildlife habitat; outdoor recreation; protection and management of watersheds; efficient and economical utilization of forest products; and forest economics. A continuing forest survey provides comprehensive information on the extent and condition of forest lands, the volume and quality of timber resources, trends in timber growth and harvests, and the outlook for future supplies and demands.

Forestry Progress Through Research

The young plywood industry in the South enters its second year of operation with a bright future. This new use of southern pine grew out of Forest Service and industry research. Its output will help maintain the plywood industry's position as the fastest growing industry in the United States, according to Federal Reserve Board statistics.

In 1964, three plants began producing plywood in the South. Thirty additional plants are being built or are slated for near-future construction. By the end of 1965, southern plants will produce more than 1 billion square feet of plywood, constituting two-thirds of the plywood expansion scheduled nationally and about 8 percent of the expected demand. Leaders of the industry regard this new development in the South as a major achievement that will carry a wide and beneficial impact on that region.

Laboratory and field findings that led to this revolutionary step in plywood production were part of the continuing research effort of the Forest Service. Out of its laboratories, experimental forests, and cooperative studies flow new products, techniques, and findings to improve management and utilization of renewable forest and range resources.

A new use for southern pine boltwood that could prove beneficial for investment and employment in rural areas, an electronic device for fire detection, safer pesticides, new techniques in the study of tree-damaging beetles, balloon logging, a current appraisal of the timber situation in the United States—these are some of the many results of Forest Service research in 1964. Often such results come about through cooperation with industry, universities, States, and others.

FOREST PRODUCTS UTILIZATION RESEARCH

Beams From Southern Pine Boltwood

From Virginia to Texas, southern pine forests abound today in 8- to 12-inch trees, many of which should be harvested to thin woodlands and to improve growth on residual forest stands. But these trees are now in excess supply and need a better market outlet.

According to a recent study, such an outlet may be developed through the use of these trees in the manufacture of continuous high-quality laminated beams. Specialized machinery is being developed to make the operation profitable. A newly invented heading converts barked logs into smooth square cants and salable pulp chips. There is no sawing and no sawdust or slabs. The undried cants are sliced into pieces 0.6 inch thick. After rapid drying by a new commercial "jet" process, the veneers are machine graded for stiffness and fed into a finger-jointing and gluing machine which directs stiffer pieces to the outside of the beam. Following electronic gluing, the continuously produced beam is sawed to desired lengths. Experimental beams made by the new process were as strong as commercial grades made from solid and costlier raw material.

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Assuming that the needed new machinery can be developed, a $1,700,000 investment by industry in plant and working capital could employ about 136 people to produce 2,750 cubic feet of beams and 188 tons of pulp chips daily. A number of such plants could be supported by the timber resource.

New Grading System

A new system has been developed for grading inland Douglas-fir logs in standing trees. The system uses fewer grades, is easier to apply, and segregates logs into value classes more accurately than the systems it replaces. Lumber yield tables are being developed so that the new grades can be put into use by the Forest Service, other Federal agencies, and by industry. The system has been approved for use by the Forest Service on an interim basis.

Flow of Lignin Discovered

A Forest Products Laboratory researcher has obtained photographic evidence that lignin softens and flows when wood is heated. This was done during advanced study in electron microscopy in Europe under the Government Employees' Training Act, Public Law 85–507.

Electron microscope studies of wood have shown that the inner surface of the cell wall has a wart-like appearance. These warts are thought to consist largely of lignin, as are the lignin-containing toruses that screen the pit openings in cell walls. Examination of heated wood samples under an electron microscope clearly showed that both the warts and toruses liquefy and flow at 190°, 200°, and 240° C. At these temperatures, the cellulose appeared to be unchanged.

It has long been hypothesized that lignin is plasticized when wood is heated. This accounts for the fact that wood, when compressed under heat, remains in a compressed state after the compressive force is released.

These findings lead to interesting speculation. Since lignin softens before heat affects cellulose, it appears to have a protective as well as an adhesive role in wood. It is possible, therefore, that further research may lead to more effective fire retardants chemically designed to inhibit the softening of lignin and thus modify pyrolysis and combustion processes.

Fire-Resistant Wood Shingles

Can wood shingles be made fireproof? Growing popularity of wood shingles and shakes in today's houses has brought a major revival of the market for these products. However, there is a need for more permanent fire-retardant treatments. Fire retardants in the past have consisted of water-borne salts with poor resistance to leaching by rain water.

The Forest Products Laboratory has investigated a tetrakis (hydroxy methyl) phosphonium-urea and melamine-resin system developed by the Southern Utilization Laboratory of the Agricultural Research Service for use as a fire-retardant treatment for fabrics. Studies showed that when these chemicals, dissolved in water, are applied to wood, they react in place to form an insoluble resin. Although not as effective under severe fire conditions as inorganic salts that can be used where leaching is not a problem, the chemical-resin system showed excellent promise on wood shingles and shakes. Several companies are now actively studying its commercial possibilities.

Pulping Process Eliminates Stream Pollution

The original neutral sulfite semichemical process, developed by the Forest Products Laboratory, which brought hardwoods prominently into use for papermaking, has now been further improved by modifying it to permit relatively low-cost elimination of stream pollutants. A modified process, called bisulfite semichemical pulping, can be used to make corrugating medium and other packaging board products. A magnesium rather than sodium base is used because magnesium bisulfite can be recovered by use of a relatively simple principle adaptable to a fluidized bed combustion furnace. Since this recovery system is much less expensive to install than conventional pulp chemical recovery systems, it becomes practical for comparatively small mills to burn their effluent, thus eliminating pollution problems. The development was demonstrated in a recent full-scale trial at a corrugating board mill. Up to 90 percent of the pulping chemical was recovered with only a small drop in pulp yield. All hardwoods as well as softwoods may be pulped with the new process.

Wood Houses Resist Quake in Alaska

The excellent performance of wood-frame houses in the record-breaking earthquake at Anchorage, Alaska, substantiated Forest Products Laboratory recommendations on house construction, based on its research results. In areas where severe earth slides occurred, properly constructed wood-frame houses retained much of their structural integrity. Well-constructed wood-frame houses probably had much to do with the low casualty list, since they provided safe refuge to the occupants during the long shock period.

FOREST ENGINEERING RESEARCH

Systems Engineering

Analysis of the results of analytical and logistical studies on balloon logging indicates that such a system may prove technically and economically feasible in harvesting timber from difficult access areas and highly erodible soils. One balloon logging operation in Oregon is already underway and plans are being made to conduct full-scale operational tests and evaluation programs to substantiate study results.

This balloon logging research represents the first large-scale application of systems engineering to

solution of logging problems. Studies were conducted in cooperation with a leading aerospace industry where full advantage was taken of the availability and application of systems engineering analysis techniques which have proved so successful in the space program. Application and use of these concepts can lead to revolutionary developments in forestry engineering operations.

FOREST ECONOMICS AND MARKETING RESEARCH

Nationwide Timber Appraisal Completed

A new appraisal, "Timber Trends in the United States," presents a comprehensive picture of the Nation's timber situation as of 1962 and the outlook for timber supplies and demands to the year 2000. Published early in 1965, this report shows that significant improvements in timber growth have been achieved during the past decade.

Growth of both softwoods and hardwoods in the East is now substantially in excess of the cut. In the West where most of the timber is still in old-growth stands, timber supplies available for harvesting also exceed the present cut. As an offsetting factor, a continuing decline in the quality of timber resources presents major problems for the timber industries.

Projected demands for pulpwood and veneer logs in the year 2000 reach 2.7 times the level of consumption in 1962. Demands for lumber are projected to rise about 43 percent in this period, while further declines in use of fuelwood are anticipated. Projected use of all timber products rises from 11.8 billion cubic feet in 1962 to 21.3 billion cubic feet in 2000—about double today's demands. To meet these projected demands for roundwood, the total cut of sawtimber in domestic forests, after allowances for imports, is expected to rise from 48.4 billion board feet in 1962 to 81 billion board feet by 2000.

With recent levels of management, projected timber supplies appear sufficient to meet demands for the next three decades; however, by 2000 projected supplies fall short of the estimated cut by about 16 percent. Projected demands in 2000 could be met if forestry programs were intensified more or less in line with recent trends, if present areas of forest lands remain available, and if industrial technology is further developed to fully use the kind of timber that will be available.

Timber Resources Increase in Georgia

The third forest survey of Georgia revealed an increase of 4.5 million acres, or 21 percent, in the area of commercial forest land during the past 25 years. Much of this increase occurred in the Piedmont, where large areas of former cropland have reverted to forest as a result of planting and natural reseeding of pine. In recent years growth of softwoods has exceeded the cut, growth of hardwood growing stock barely replaced the cut, while hardwood sawtimber growth was less than the cut. The number of slash and longleaf pine trees available for gum production is at least 3.5 times the number being worked for gum naval stores.

Eastern Oregon Resurvey Completed

A new report for eastern Oregon shows that this important timber area contains 11.5 million acres of commercial forest land, with a total volume of 125.5 billion board feet of sawtimber. More than 90 percent of the timber cut goes into one product—lumber. Future growth and development of the forest economy of eastern Oregon will depend to a great extent upon full utilization of the forest through product diversification, including remanufacture of lumber and development of wood-using industries based on plant residues. Conversion of 1 million board feet of standing timber to logs, for example, now provides 2.7 man-years of employment in eastern Oregon, about 7.0 man-years when converted to rough dry lumber, and 15.4 man-years converted to millwork. Production of plywood furnishes about 15.8 man-years of employment per million board feet of timber.

Timber Supplies Up in West Virginia

A recent resurvey of West Virginia's timber resources shows a 65-percent increase in sawtimber volumes in the past 12 years. About 60 percent of the current sawtimber volume is in trees 15 inches in diameter and larger. Net annual growth of sawtimber now totals about 1 billion board feet, or twice the current sawtimber cut. Commercial forest land now totals 11,389,000 acres, an increase of 1,500,000 acres, or 15 percent. The published report, "The Timber Resources of West Virginia," contains statistical tables showing detailed forest resource information for each county in the State.

Varied Forest Ownerships

Studies of forest-land ownership showed that in the eastern Missouri Ozarks, business and professional people own 39 percent of the nonindustrial private forest land, retired people 31 percent, farmers 20 percent, wage earners 6 percent, and housewives and widows 4 percent. Owners averaged over 50 years of age and held an average of about 500 acres of woodland. For the most part, owners purchased their woodlands and have held them on the average for about 16 years. Nearly three-fourths of the woodland area was estimated to be worth $10 or less per acre because the timber stands have deteriorated.

Related studies of forest owners in Ohio showed that those most likely to adopt one or more woodland management practices were characteristically innovators, participants in the Agricultural Conservation Program, educated through or beyond high school, and owners of more than 100 acres of woodland. Owners most likely to adopt

woodland practices were also less than 50 years old, with a gross annual income of $10,000 or more. Profits from timber appeared to be the principal objective of woodland owners, but they were hampered in this by lack of technical knowledge, more rewarding alternatives, and lack of time for forestry activities.

Factors in Wood Industry Location

A study covering four wood-using industries of the northern Appalachians—lumber, furniture, particleboard, and pulp—showed that in these industries costs of wood, labor, and transportation are the most important production factors in deciding the choice of location for new plants. Other factors such as State and local taxes, local financial assistance, and the cost of industrial sites were much less important for all four industries. Results of this study are designed to help development agencies in identifying industrial prospects and furnishing information about the factors most important in location decisions.

Industry Consumption of Timber

A survey of wood products used in manufacturing industries in 1960 showed a total consumption of some 11.7 billion board feet of lumber and 2.6 billion square feet (1-inch equivalent thickness) of plywood and veneer, hardboard, and particleboard. About 52 percent of these wood products was used in five industries: millwork, containers, wood household furniture, hardwood dimension and flooring, and miscellaneous wood products including pallets, handles, woodenware, and turned products. Detailed figures on wood consumption are available by kind of wood and by industry.

TIMBER MANAGEMENT RESEARCH

Repellent Coating for Direct Seeding Improved

A new and improved repellent coating for direct seeding, containing Arasan 42–S, has been developed at Alexandria, La. It is easier and simpler to apply and more durable than the coatings used previously, and it is well suited for hand-seeding operations because it gives off no chemical dust. Arasan 42–S is an aqueous suspension of thiram, the chemical that has been used in powder form as a bird repellent since 1955. Though nontoxic at normal levels of exposure, thiram is a skin irritant, and hence the task of handling seed treated with the dry powder is disagreeable. Pilot-scale trials, ranging in size from 50 to 600 acres, demonstrated that the new material can be applied rapidly, that seed flow through various types of metering devices is not adversely affected, and that durability under field conditions is superior to that of the powder. While safeguards must be observed in mixing the formulation, the coated seed can be handled at loading sites without discomfort caused by thiram dust. This new liquid formulation is expected to replace the dust-forming treatment and sublimed synthetic anthraquinone.

Inherited Resistance to Needle Disease

Regeneration of longleaf pine is hindered by the brown-spot disease; however, high resistance to this disease has been found in some longleaf pine seedlings in Louisiana. These were the progenies of a tree which was found as a disease-free seedling in 1937. Wind-pollinated seed from this tree produced seedlings that had only about 10 percent of infected foliage compared with about 50 percent infection in ordinary stock. These observations indicate genetic control of the resistance to brown-spot in longleaf pine seedlings and provide hope that further selections for resistance will be successful.

Instruments Reduce Timber Inventory Cost

A new procedure developed in research on timber measurements makes use of an optical dendrometer and an improved sampling system to obtain accurate volume estimates of timber stands at greatly reduced cost.

Dendrometer measurements of tree height and diameters at several points along the stem are used directly in a high-speed computer program to produce tree volumes and supplementary information. The geometric principles of optical dendrometers, a description of the sampling system, and the computer program are contained in publications of this research. Detailed field evaluation of this revolutionary method of timber inventory is now underway.

Sampling Methods Cut Scaling Costs

The cost of scaling all the logs in a timber sale sometimes is excessive and out of proportion to the value of the logs. A study conducted by the Forest Service's Pacific Northwest Station in coastal Oregon found that scaling a randomly selected sample of truckloads not only yielded considerable savings but resulted in highly acceptable accuracy standards when compared with total scaling. A second sampling method that involved weighing all loads and converting weight to board-foot scale by a converting factor determined from a sample scale proved to be slightly more accurate, but also more costly, than straight sample scaling. Both methods of sample scaling will probably be used widely to reduce scaling costs.

Sweeter Sugar Maple Trees

The cost of producing each gallon of maple sirup is closely tied to the sugar content of the sap, and it has been shown that sweetness in sugar maple sap is inherited. By 1962 criteria had been developed to grade sugar maple trees for sugar content and other desirable characteristics. Individual analyses of sap from more than 2,000 trees that year led to selection of 35 trees that were at least 50 percent above the average in sweetness. With

improved methods in initial selections during 1963, 3,300 trees were screened and 84 were found with substantially higher sugar yields than nearby trees. Some trees located have 8 percent sugar content in the sap, whereas the average is 2.5 percent. State groups have been organized in Maine, Massachusetts, New Hampshire, Vermont, and New York to screen sugar maple trees for sweetness and other desirable traits. The superior trees are being used as the basis for a breeding program to develop superior stock.

Hybrid Poplars on Mine Spoil Banks

The reclamation of strip-mined land is being speeded by hybrid poplars which have grown well on some sites on the spoil banks. Out of 50 hybrid poplar clones planted on two kinds of graded spoil banks in Harrison County, Ohio, more than a dozen have survived and grown well. The American eastern cottonwood, the European black poplar, and a species from east Asia were among the parents producing the best hybrids. In a screening study in Pennsylvania and West Virginia of 60 different clones for spoil bank planting, the best hybird grew 7 feet in 2 years. Survival and growth, however, were poor on the very acid spoil banks. Special care must be taken in selecting planting sites to take advantage of the growth potential of the hybrid poplars.

FOREST FIRE RESEARCH

While many critical fire situations in 1964 again demonstrated the magnitude and complexity of the forest fire problem, research progress shows that new capabilities are being developed for the nationwide fire control effort by private, State, and Federal agencies.

Forest Fire Laboratories

Operation of the new forest fire laboratories at Macon, Ga., Missoula, Mont., and Riverside, Calif., demonstrated their potential to serve as focal points for cooperative fire research efforts. Cooperative activity with private, State and Federal fire control agencies, the Department of Defense, and others increased and produced results such as the following:

(1) Experimental fires performed under controlled or measured conditions with flame areas from 1 square inch up to 5 acres provided new information on fire behavior. (2) Wind tunnel experiments yielded vital knowledge of the mechanisms of fire spread and the effectiveness of firefighting chemicals. (3) Forest fuel experiments showed basic features of ignition, flammability, and physical and chemical characteristics. (4) Radar imagery of lightning storms relayed to monitoring scopes in a fire laboratory permitted new insight into important features of lightning fire patterns in the western United States. (5) Fire whirlwinds were modeled to determine their cause and effects.

Forecasting Fire Behavior

New information this year improved our ability to forecast fire behavior and to plan fire control operations.

Weather patterns which trigger blowup fires have been identified for each of 14 areas where critical fire weather and potentially critical fire behavior occur. This new information with predictive guides aids fire weather forecasters and fire control planners.

Flame temperatures in large fires are much higher than previously supposed. Although the standard for testing the effectiveness of chemical fire retardants has been 1700° F., flame temperatures in large test fires consistently exceeded 2500° F., and may have reached 3000° F.

Radiation is of minor importance to fire spread in wind-driven fires. Both wind tunnel and outdoor test fires show that spread occurs primarily by direct flame contact and by firebrands falling ahead of the main fire front.

Research at forest fire laboratories to develop new knowledge and technique for air and ground attack on fires with chemicals has produced useful results quickly. Research seminars on firefighting chemicals were held at each of the fire laboratories to extend this knowledge to fire control operations.

Private, State, and Federal fire control personnel received information and working tools needed when using firefighting chemicals. These included forest fire characteristics that respond to chemical treatment; new data on the effectiveness of different chemicals as fire retardants; how effectiveness of fire retardants varies with the fire and fuel environment; the length of time retardants can be expected to remain effective and how to select a retardant for a given set of conditions; how to mix, handle, and apply different fire retardants; specialized equipment needs for mixing, pumping, transporting, and applying retardants; and how to maintain quality control in an operating system employing fire retardants.

Electronic Fire Surveillance

Good progress continues in the program of the Northern Forest Fire Laboratory, Missoula, Mont., to develop an electronic fire surveillance system.

An electronic system to locate areas being subjected to lightning strikes was tested. Preliminary results of infrared scanning equipment show possibilities for developing a new approach to fire detection with a system that will detect small fires at night or through dense smoke, rapidly scan large forest areas, and relay information to dispatching centers for prompt use in firefighting operations.

Operational tests were made of an airborne electronic fire mapping system including an infrared scanner, readout unit, and Polaroid camera for rapid processing of fire imagery. Tests on large fires in Montana, Idaho, Oregon, Nevada, and

California showed that this unit can provide accurate fire information for firefighting operations.

FOREST INSECT RESEARCH

Attention this year was focused on a crisis in American forestry. Public concern about toxic and persistent chemicals used in insect control demanded that research give greater emphasis to the biology and behavior of insects, ultimately leading to the discovery of biological, cultural, and improved chemical methods in the fight against forest pests.

Biological Studies in Insect Rearing

A new laboratory technique with far-reaching effects has been discovered as a result of intensive study of the southern pine beetle. The technique makes possible the continuous rearing of this insect in the laboratory, a problem that has defied solution for many years. Thus, beetles of known biological background are available year round for basic research on physiology, nutrition, genetics, behavior, and other biological aspects. These must be thoroughly investigated before insect control measures can be developed that utilize biological organisms, attractants, sterilization techniques, and improved insecticide formulations.

The reproductive potential of defoliators such as the black-headed budworm in Alaska and the elm spanworm in the South was found to vary with the food of the insect. Budworm larvae reared on Sitka spruce produced adult females with more eggs than those fed on hemlock; elm spanworm larvae fed on hickory produced females with many more eggs than larvae fed on oak.

Findings such as these are of great importance in forecasting insect population trends and in making decisions for or against application of control measures.

Parasites and Predators

Promising results were obtained in studies of disease organisms for the control of pest insects. Sprays containing a native polyhedrosis virus alone and in combination with *Bt* (*Bacillus thuringiensis*), applied to aspen foliage, gave high degrees of kill of the Great Basin tent caterpillar. Control ranged from 84 to 98 percent. *Bt* alone was less effective. However, *Bt* gave encouraging field test results for control of the lodgepole needleminer in California.

Streptococci may provide another tool in the fight against the gypsy moth. Twenty-three strains of this group of bacteria were isolated from gypsy moth larvae. When fed directly to healthy larvae they produced pathogenic effects.

Insect predators are also showing promise in the biological control of pest insects. A single adult checkered beetle was found to kill up to 200 adults of the tree-killing southern pine beetle in its lifetime. Its larval form will eat up to 400 pine beetle larvae. Full knowledge of the predator and the bark beetle, along with development of manipulation techniques, could provide a means for controlling the pest.

An unexpected phenomenon was recently observed in the biological control of a destructive defoliator, the elm spanworm. After 7 years of spread and destruction, uninterrupted by natural control measures, spanworm numbers suddenly declined. Studies showed that a minute fly, an egg parasite, was responsible. The finding presented an enigma. Why had entomologists been unable to detect parasitism or the parasite before this? A recent discovery provided the answer: the minute fly first parasitized eggs of another pest, the fall cankerworm, and thus built up its population. It then parasitized elm spanworm eggs just before they were due to hatch. This discovery plus additional biological information should lead to use of the parasite to control the spanworm and the cankerworm.

Greater Safety for Insecticides

A new chemical insecticide project was activated at Berkeley, Calif., in January 1964. Its purpose is to find less persistent and safer chemicals and techniques of application for destructive forest insects. About 20 compounds are presently being tested on such species as the spruce budworm, the Douglas-fir tussock moth, and the pandora moth. Results with the spruce budworm suggest that treatments may be available for pilot testing during the next field season.

Research at other installations is also yielding promising results. The systemic chemical phorate is giving outstanding protection to young cottonwood trees against damage by borers, defoliators, and sucking insects. Introduced by dipping cottonwood cuttings in the systemic at time of planting, the chemical protects the tree during the critical period of its life. Phorate-treated trees, now 4 years old, are 4.5 feet taller than untreated trees of the same age. The trunks of treated trees are larger and straighter and have fewer branches than untreated trees.

Another systemic, Bidrin, introduced into the trunks of white pines is giving promising control of the white pine cone beetle, which causes severe damage to the tree seed.

Screening studies of a series of new insecticides, relatively low in toxicity to wildlife, resulted in a high degree of success against the gypsy moth. Certain chemicals, compared to DDT, gave a higher kill of larvae when used in equal concentrations.

Dimethoate is giving promising control of the spruce budworm though the desired degree of control has not yet been achieved. When dimethoate was applied by helicopter in concentrations of 4 and 8 ounces per gallon of water per acre, 85 percent control of 5th instar larvae was obtained.

FOREST DISEASE RESEARCH

Dwarfmistletoes

Significant advances in our knowledge of dwarfmistletoes were made by researchers in the Pacific Northwest, Rocky Mountain, and Intermountain Stations.

Effectiveness of sanitation thinning operations to control dwarfmistletoe on ponderosa pine on the better sites in the Pacific Northwest may depend more on enlarged growing space than on removal of infected trees. Trees with adequate growing space on fair to good sites may outgrow the parasite long enough to produce a commercial yield.

Studies of dwarfmistletoe on lodgepole pine in Montana, Wyoming, and Colorado have greatly increased our knowledge of infection, rate of spread, and incubation period. These factors are all critical in timing operations in dwarfmistletoe control. Fourteen percent of the stands that had dwarfmistletoe were infected before they were 4 years old and 84 percent were infected before the 11th year, indicating that control efforts in lodgepole must concentrate on protecting the young reproduction. The amount and severity of dwarfmistletoe on lodgepole pine in the areas studied was highest on the better sites.

Mycorrhizal Investigations

Some soil micro-organisms may provide a more effective biological barrier to diseases than others. It has been shown by workers at Corvallis, Oreg., that the influence of mycorrhizal fungi on the rhizosphere of forest trees may affect the ability of parasitic fungi to attack roots. The research suggests that a mycorrhizal fungus may protect its associated root by (*a*) utilizing surplus carbohydrates thus reducing the root's attractiveness to the pathogen, (*b*) serving as a physical barrier to infection, (*c*) secreting antibiotics, and (*d*) attracting, together with the root, other protective organisms of the rhizosphere. This work greatly strengthens the hypothesis that mycorrhizae are of protective as well as nutritional value to the tree.

Controlled manipulations of soil to encourage or discourage specific organisms affecting the growth and health of forest trees are portended by research done at the Forest Disease Laboratory at Beltsville, Md. Individual characteristics of growth and respiration at different temperatures have been determined for seven mycorrhizal fungi. It appears from this work that pH (hydrogen concentration) is a useful indicator of the metabolism, growth, and senescence of fungi grown in the laboratory. Methods altering pH in forest soils are known and the gap between the laboratory and practical application is rapidly disappearing.

Root Disease in Sugar Pine Nurseries

The fungus *Macrophomina phaseoli* continues to be the most important pathogen of coniferous seedlings in the forest tree nurseries of California. It attacks Douglas-fir and giant sequoia seedlings, but is particularly injurious to 1-year-old sugar pine in nurseries throughout the State. Recent studies showed that the ability of this fungus to infect young sugar pines is sharply controlled by temperatures; e.g., an increase in temperature increases the disease. Shading of nursery beds lowers soil temperatures and offers excellent opportunities to reduce the heavy annual losses from this disease.

FOREST RECREATION RESEARCH

Measuring Recreation Use

Estimating recreation visits and measuring kind and amount of recreation uses have, heretofore, been expensive but necessary for effective management planning. A relatively simple and much less expensive method, relating highway traffic axle counts to numbers of visitors and their type and amount of recreation use, was developed in the Southeast. The technique has proved to be efficient and reliable; it has been widely adopted in the Southeast and other sections of the country.

In California, records of ski tow lift tickets or restaurant receipts provided estimates within 8 percent of true attendance at winter sports areas.

Will Private Recreation Pay?

Privately owned farm woodland recreation enterprises are more likely to be profitable if they are near large metropolitan areas and they provide a combination of services and outdoor facilities. A study of private forest picnic enterprises in Ohio showed that visitors want more than just picnicking facilities. Income from one-third of the private forest picnic enterprises was not enough to cover operating expenses, and an even larger number of enterprises did not compensate the owners for their labor, management, and interest on investment. However, incomes were substantially enlarged by (1) increasing the amount spent on advertising, (2) provision of swimming facilities, (3) locating within 30 miles of a metropolitan area, (4) increasing the number of complementary services provided, such as playground equipment and leadership in outdoor activities, and (5) locating in an area where family incomes are high.

The opportunity for a woodland owner to make recreation pay is alo governed by his aptitudes, interests, and skills. Ability to manage time, labor, capital, and people efficiently is as important in the recreation business as in any other.

Access for Hunters

Hunters fit more than one pattern, and better understanding of their differences can mean better hunting and better management of the recreation and wildlife resource. A Forest Service analysis was made of the location of 4,100 deer kills during four hunting seasons on 14 wildlife manage-

ment areas in North Carolina. Most deer were harvested close to roads and trails. However, important and surprising differences were found between the Piedmont and western mountain region in the use of roads and trails. In rugged mountain areas, largely populated with rural residents, hunters made exceptionally good use of all parts of the forest, and their kills were uniformly distributed. But hunters in the gently rolling Piedmont, coming from nearby cities, apparently stayed close to access roads and did not penetrate the more remote sections. In all areas, trails were used as heavily as roads; thus for additional access in hunting areas trails may be preferred, being cheaper and usually more esthetic.

Camper Patterns and Campground Standards

Campgrounds cost a great deal to develop and maintain, and ways are being sought to construct and operate them efficiently and inexpensively. Some campers prefer to be surrounded by many of the conveniences of home and the sociability and security of other people, while others pack their equipment across miles of rugged country in search of solitude and the experience of roughing it in truly wild surroundings.

Camping tastes of all shades are found between these extremes, and the needs of different campers cannot be fulfilled by one standard type of campground. Seven types of campgrounds are described in a Utah study—varying from highly developed central camps to small back-country camps. Variation in campground design and layout to fit camper types should (1) protect areas from deterioration, (2) satisfy the needs of gregarious groups as well as those seeking privacy, and (3) make more efficient use of available funds.

FOREST SOIL AND WATER RESEARCH

Late Summer Streamflow Increased

Cutting the dense old-growth Douglas-fir timber from only a portion of a 250-acre watershed in the western Cascades of Oregon has increased late-season streamflow (August–November) as much as 22 percent. Soil moisture measurements have shown that water losses through evaporation and transpiration decrease as much as 80 percent after logging and that soils remain near field capacity throughout the summer. In application, sustained summer flows would greatly benefit important Northwest fisheries and irrigation water users.

Conifers Delay Winter-Spring Runoff

On the Allegheny Plateau in central New York, conifer plantations tend to concentrate snowmelt runoff in the spring season. Less than one-third of the snow had melted by late March from a watershed 84 percent forested with 25–30-year-old conifer plantations. In contrast, snow from a watershed with 80 percent open land was half or more melted by the same date. By retarding the beginning of rapid melt and retaining greater reserves of snow, the plantations produced greater runoff in the spring with its higher temperatures. Thus it may be desirable to break up conifer plantings with patches of hardwoods or openings to avoid accelerated flooding in the spring.

Selecting Trees for Eroded Soils

Trees and shrubs that will grow on and give protection to severely eroded lands in the South are being sought. Loblolly pine seedlings from seed grown in Caldwell County, Tex., outgrew those from three other seed sources by 3.7 feet in 5 years on droughty sands in north Mississippi. Physical characteristics of the needles tend to reduce the loss of moisture from the trees, thus improving their chances for survival and growth. The needles have less surface in proportion to volume, fewer stomata per unit of needle surface, and thicker peripheral tissue.

RANGE AND WILDLIFE HABITAT RESEARCH

Increasing Livestock Returns

Integration of seeded ranges with native pine-bunchgrass ranges promises to be a practical and profitable livestock management system in the Front Range of the Rocky Mountains. In 1963 calves raised part time on native range and part time on ranges seeded with Russian wildrye (*Elymus junceus*), crested wheatgrass (*Agropyron desertorum*), and Sherman big bluegrass (*Poa ampla*) weighed an average of 17 pounds more per head when weaned than those raised on native range alone; the latter is the practice commonly followed in the area. Based on 1963 prices, each calf raised under the integrated grazing system was worth $4.10 more than one raised on native range.

Longleaf Pine Reproduction on Grazed Areas

Research on longleaf pine-bluestem range in central Louisiana has demonstrated the compatibility of beef production with pine regeneration. Where good herd management was applied, browsing damage to planted pines was negligible under yearlong moderate grazing (50 percent forage utilization). Even on a more heavily grazed range (65 percent utilization), the proportion of seedlings damaged was low: 12 percent were browsed lightly, 4 percent moderately, and 1 percent severely. On direct-seeded range, grazing reduced the number of pine seedlings at the end of the first growing season, but stocking was more than adequate even under heavy grazing.

Timber Harvest Increases Deer Browse

By proper manipulation of residual stand density, northern hardwood pole stands can be made to produce desirable levels of both game browse and timber. In a cooperative study by the North-

eastern Forest Experiment Station and the Pennsylvania Game Commission, cutting 50-year-old hardwood stands to residual basal areas of 0, 15, 30, 45, and 60 square feet per acre resulted in an average annual production of 45, 36, 34, 22, and 17 pounds (green weight) of browse per acre, respectively, during the first 3 years after cutting. The treatment which left 60 square feet probably approaches the optimum level of thinning required to produce quality timber. However, in some areas it may be prudent to compromise management treatments between optimum timber production and browse production to better meet the demands for both.

Forest Openings Important for Elk Habitat

Recent studies have shown that natural openings in the forest are an important part of elk habitat in the Southwest. In a ponderosa pine forest in Arizona, where natural openings comprised 13 percent of the forest area, elk used the openings 1.8 times more heavily than adjacent forest. Elk made best use of openings up to 45 acres and made relatively less use of larger areas. On the other hand, deer made about equal use of small openings and the surrounding forest. Harvesting Arizona timber by clear cutting in small blocks, then, should improve elk habitat without being detrimental to deer.

FOREIGN FORESTRY SERVICES

Principal activities of the Forest Service in this field include (1) the training of foreign nationals, (2) technical assistance to foreign governments through foreign aid and other programs, (3) participation in meetings of appropriate international organizations, and (4) the translation into English of important scientific documents related to the broad field of forestry.

A report, "Forests and Forest Industries of Brazil," was issued during the year as USDA Forest Resource Report No. 16. This report brings together the most significant of the widely scattered information on forests and forest industries of that country as an aid to a better understanding of their role in Brazil's development and as a base for forest-products trade with the United States.

Training Foreign Nationals

The Forest Service prepared or assisted with the preparation of 158 training programs or study tours in the United States for 346 foreign nationals from 54 countries. In addition, refresher programs were prepared for three employees of the Agency for International Development that had been on foreign assignments. This was a 12-percent increase in the number of programs prepared and an 11-percent increase in the number of participants given assistance, above the 1963 levels.

All sponsoring agencies requested training for more foreign nationals in forestry and related fields than in 1963. Two hundred and fourteen participants were sponsored by the Agency for International Development, 18 by agencies of the United Nations, and 117 were sponsored either by themselves, by their employers and governments, by international foundations, or by the U.S. Department of State through its educational and cultural programs. The Forest Service had primary responsibility for 64 percent of the programs in which it participated.

Foreign participants spent, in the aggregate, 3,580 man-days in training at Forest Service field units. Forest Service personnel spent 3,650 man-days (2,023 man-days in the field) on the foreign training program.

Technical Consultation and Support

More than 500 requests for technical information and other assistance were filled. These originated in 64 countries and included (1) procurement of seed, (2) supplying technical publications on practically every aspect of forestry and wild land use, and (3) purchase of instruments, equipment, and supplies requisitioned by foreign governments through the forestry advisers of the Agency for International Development.

During the year, the International Agricultural Development Service was created within the Department of Agriculture to facilitate cooperation with the Agency for International Development (AID). Under this new arrangement AID enters into cooperative agreements in which USDA assumes responsibility for specified agricultural and forestry programs in selected developing countries. The specialists assigned to a project continue as USDA employees and are supervised and supported directly by the USDA with funds supplied by AID.

Under agreements already consummated, the Forest Service sent, during the year, 16 specialists to 6 countries on short-term assignments as follows: Honduras, 10; Costa Rica, 2; Turkey, 1; Brazil, 1; India, 1; and Latin American Region, 1. The large number in Honduras was in response to a catastrophic bark beetle epidemic which required men of widely varying skills.

At the end of 1964, 39 U.S. foresters were on 2-year assignments with AID in 13 countries. Of these, 23 were former employees of the Forest Service. Similarly, 18 U.S. forestry specialists were on long-term assignments abroad with the Food and Agriculture Organization of the U.N. Also, nine U.S. foresters were assigned in eight countries on projects sponsored by private foundations and associations, special congressional legislation, university or other contracts, and by foreign governments. Three Forest Service scientists reviewed research financed by foreign currencies under Public Law 480 at research centers in three countries.

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International Organization Activities

The Ninth Session of the Latin American Forestry Commission, held in Curitiba, Brazil, was attended by a U.S. delegation. The delegation participated in the work sessions of the Committee on Research, and the organizing meetings of the Committees on National Parks and Wildlife, and Watershed Management and Torrent Control. The Commission accepted the U.S. delegate's proposal to coordinate the work of the Commission's committees by identifying problem areas and eliminating duplication of work. This task of coordination was assigned to the Executive Committee.

Other principal international conferences attended by Forest Service representatives during the year included the Permanent Committee of the International Union of Forest Research Organizations in Turkey; the FAO Advisory Committee on Forestry Education, Venezuela; VIII Congress of the International Society of Soil Science, Rumania; the FAO/IUFRO Symposium on Internationally Dangerous Forest Diseases and Insects, and the International Congress of Entomology, both held in England; the Pan American Union Seminar on Building Material Standards, Brazil; and the X International Botanical Congress, Scotland.

FORESTS COVER ONE-THIRD of the land in the continental United States. Over 70 percent of the commercial forests is owned by private citizens. The Forest Service cooperates with State agencies and private forest owners to (a) protect 431 million acres of State and privately owned forests and watersheds against fire, insects, and diseases; (b) encourage better forest practices for conservation and profit on the 358 million acres of private forest land; (c) aid in distribution of planting stock for forests and shelterbelts; and (d) stimulate development and management of State, county, and community forests.

Cooperation—State and Private Forestry

A church group came into possession of 210 acres of timberland a few years ago. None of the group knew about timber, so nothing was done either with or to the land. Recently they contacted the local service forester to mark the exact location of the tract.

The forester cruised the tract and submitted a written plan with recommendations for managing it on a productive basis. The first of these recommendations was for a timber sale, with which the church concurred. Bids were solicited and a contract drawn up with the successful bidder. Work is now in progress and approximately 300,000 board feet of stave bolts and saw logs will be cut out.

The church will realize as much as $15,000 from the sale. It has agreed to put part of this income back into the land to improve the remaining timber. One of the graduates of the local Area Redevelopment Administration's sponsored school for timber stand improvement has been hired to do the improvement work.

Forest Service files contain many similar reports that tell how the cooperative forestry programs, working through State Foresters and their State and federally financed service foresters, help the private woodland owner, operator, and primary processor. Cooperation is the keyword in an overall view that recognizes the value of all forest resources, public and private, to the Nation's economy, and the need to keep these resources productive, profitable, and in good shape through effective management.

FORESTS AND RURAL AREAS DEVELOPMENT

In many low-income rural areas there is considerable commercial forest land. Because of past exploitation and lack of protection and management, much of this land fails to contribute its full potential to the local economy. The Forest Service works with State Foresters, other public agencies, forest industries, landowners, development groups and others to promote and encourage full use of all the forest resources—timber, water, wildlife, recreation, forage, special forest products—and multiple use opportunities.

Under the Department of Agriculture's continuing efforts to develop rural areas, the Forest Service has moved out on many fronts to make forestry contribute wherever possible to the socioeconomic growth of rural America. In order that Rural Areas Development committees may be assured of technical forestry information and assistance, Forest Service and State forestry representatives serve on all State Rural Areas Development Technical Action Panels and work closely with county and other local planning groups.

The Forest Service is the consultant on forest products, forest management and protection, forest industries, forest-based recreation, and other forest land uses to the Departments of Agriculture, Commerce, and Defense. The Area Redevelopment Administration depends on the Forest Service for professional advice on loans for forest industry and recreation development, and technical assistance grants. During the past fiscal year the Forest Service investigated, reviewed, assisted, and reported on 294 rural community development programs and projects.

COOPERATIVE FOREST MANAGEMENT

The Federal Government shares with the States the cost of carrying on work under the Cooperative Forest Management Act. In fiscal year 1964 State expenditures for this purpose amounted to $3.9 million; Federal expenditures were $2.9 million. During this period, 700 service foresters employed by 49 cooperating States and Puerto Rico helped 97,000 woodland owners to apply better management practices. This involved 6,140,678 acres, or 2.3 percent of the Nation's small privately owned forest acreage. Gross returns to these owners from the sale of forest products amounted to $15.6 million. Cooperative forest management personnel also assisted 8,691 small forest products operators and primary processors.

Multiple Use Management

The application of multiple use management practices on State and private lands continues to expand. The Forest Service is providing leadership, technical assistance, and training in multiple use management through the Cooperative Forest Management Program and the General Forestry Assistance Program.

Multiple use management may open new horizons for the private forest land owner. It broadens the concept of forestry, enabling the owner in some cases to diversify and realize additional income from related products while timber, the major resource, continues to grow. Outdoor recreation and other special products besides lumber may be marketed, particularly if the forest land is near large population centers.

Opportunities for diversified use of forest resources while waiting for timber crops to mature include wildlife areas managed for public hunting at daily or annual fees; camping, picnicking, and swimming areas open to the public at a reasonable charge; and harvest of special forest products such as Christmas trees, decorative materials, ornamental plants, seeds, and nuts. Guidance and professional assistance are provided individual landowners who seek multiple use development of their land.

General Forestry Assistance

There are certain types of professional forestry services that are not covered by State-Federal cooperative agreements and that the States generally cannot be expected to provide through their present programs. General Forestry Assistance personnel provide these services. The Forest Service also uses GFA funds to provide professional forestry services to other agencies of USDA and other Federal Departments. Many USDA programs on private, State, and county lands relate directly to forestry and require more and more professional forestry services in a variety of disciplines on national, regional, State, and local levels.

In fiscal year 1964 Forest Service personnel under the GFA program provided highly specialized forest inventory, processing, and management assistance to 28 large private and industrial land owners involving 3,879,000 acres of forest land, 15 States and counties involving 13,451,600 acres of forest land, and 25 other Federal agencies involving 579,200 acres of forest land. Forest Service personnel also provided general forestry assistance and consultation to an additional 612 forest land owners, forest product processors, and private foresters.

During the year, Forest Service personnel under this program were credited with 72 forestry publications, participated in 69 forestry study projects, serviced 153 State Accelerated Public Works projects, and provided forest product utilization and marketing advice and assistance to 77 other Federal and State industrial development groups and agencies.

Tree Planting at High Level

Forest and windbarrier planting on all classes of land in fiscal year 1964 amounted to 1,353,609 acres (including 184,035 acres direct seeded). Of this total, 73 percent was on private land, 20 percent on Federal land, and 7 percent on other non-Federal public land. Overall accomplishments were practically the same as for 1963. The bulk of the planting, on privately owned land in 15 States, was as follows:

	Acres planted on privately owned land		
	Industry owned	*Other privately owned*	*Total acres*
State:			
Florida	89, 316	39, 504	128, 820
Georgia	79, 142	29, 747	108, 889
Mississippi	30, 058	40, 972	71, 030
Alabama	44, 330	23, 060	67, 390
Virginia	39, 796	21, 797	61, 593
South Carolina	28, 670	28, 150	56, 820
Oregon	50, 284	5, 193	55, 477
Louisiana	45, 675	7, 169	52, 844
North Carolina	31, 683	14, 222	45, 905
Pennsylvania	19, 670	19, 963	39, 633
Texas	24, 176	6, 072	30, 248
Washington	22, 750	7, 071	29, 821
Tennessee	14, 297	14, 871	29, 168
Wisconsin	2, 854	22, 791	25, 645
Michigan	1, 065	24, 168	25, 233
Total	523, 766	304, 750	828, 516

Two hundred and forty-seven forest tree nurseries in 46 States produced and distributed 948,312,000 trees. This large volume includes stock for Christmas tree and windbarrier planting. Ninety-eight State-owned nurseries produced 62 percent; 26 forest industry nurseries, 17 percent; 17 Federal nurseries, 12 percent; 93 private commercial nurseries, 7 percent; and 13 other non-Federal public nurseries, 2 percent.

Direct seeding by hand, machine methods, or airplane was accomplished in 39 States on 184,035

acres; 72 percent was on private land, 23 percent on Federal land, and 5 percent on non-Federal public land. This direct seeding was done on 37,482 acres less than in 1963. In some States this reduction was due to insufficient seed supply. Windbarrier plantings, mainly in the Great Plains States, were made on 40,445 acres with 38,587 acres planted on privately owned land. This represents a total increase of 4,434 acres over 1963.

COOPERATIVE FOREST FIRE CONTROL

Forest Fire Damage Reduced

Forest fire data, as indicated by a January–June report on State and private lands, point to a more favorable year in 1964 than the previous one. During the first 6 months of 1964 the number of fires was reduced 33 percent and the area burned reduced by 64 percent compared with the same period in 1963.

In the last half of 1964 there were some spectacular fires in the West and large fires in the Midwest and East. Late fall fire hazards in the Midwest and East caused the closing of hunting seasons in some States and the issuance of warnings about use of fire in wooded areas. Unusually long and severe drought conditions existed over a large area.

Several million additional acres were put under organized protection during the year, thereby reducing the heavy losses common to the unprotected areas. In 1963 about 153,000 fires burned 6,900,000 acres. (NOTE: Total number of fires and acreage burned in 1964 will be published separately in July in a supplement to this report.)

Steps are being taken to reduce the number of fires caused by railroad operations. Such fires have increased in some States despite the change from steam to diesel locomotives.

Damage Appraisal and Legislation

A revised procedure in fire damage appraisals has been adopted. This procedure relates more closely to forest survey data collection and simplifies collection and computation of data.

State fire prevention legislation has been submitted to the Council of State Governments and is scheduled for publication in "Suggested State Legislation Program for 1965."

Replanning and Training

Fieldwork has been completed and reports submitted covering a fire replanning job on State and private forest lands and watershed areas. The increasing use and value of forest resources, and the need for better protection on nonforest watersheds are expected to increase the acreage needing organized protection and the cost of such protection.

Rural fire defense training projects have been started in the States of Colorado, Florida, Kentucky, Missouri, and Oregon. Their purpose is to train local firefighting groups to suppress fires more effectively in case of enemy attack.

COOPERATIVE FOREST FIRE PREVENTION

Stepped-up forest fire prevention efforts during 1964 helped to keep the overall fire record better than that for 1963. These efforts, including a special appeal to broadcasters and a number of restrictions on smoking, burning, and entry in wild lands, are credited with much of the improvement, since fire hazard did not decrease in areas with major fire problems.

CFFP Presentations Increase

The Smokey Bear program (CFFP) was presented and explained to more groups than in previous years. Presentations were made at the Forest Service National Fire Prevention School in New Mexico in February; at the Northeastern Forest Fire Protection Compact meeting in Concord, N.H., and at a public meeting in New Orleans in March; on "Across the Fence," a nationwide color television agricultural program in April; at a public meeting in Washington, D.C., in May; to the annual convention of the General Federation of Women's Clubs in Atlantic City in June; and to 30 foreign fire control specialists in Washington, D.C., in July.

Two "Smokeys" and three Smokey Bear exhibits brought the forest fire prevention message to more than 50,000 Scouts and visitors at the Valley Forge Boy Scout Jamboree in July.

World's Fair Has Smokey Bear Day

Appearances at the New York World's Fair included production of two forest fire prevention messages at the RCA color sound studio, a permanent exhibit at the Boy Scout Pavilion, promotions with the American Express Co. and the New Mexico Exhibit, culminating in proclamation of September 26 as Smokey Bear Day at the fair.

A presentation was made on Smokey Bear exhibits to the National Association of State Foresters at Hershey, Pa., in September.

25 Million Printed Items

The number of printed items produced increased from 22.5 to 25.5 million. Distribution of radio and television kits increased nearly 10 percent. A special mailing to business papers brought commitments to run more than 150 full-page advertisements on forest fire prevention as a public service.

Two Golden Smokeys Awarded

Golden Smokey awards (for outstanding service to forest fire prevention of national significance) were presented to the Native Sons & Daughters of the Golden West, and to the General Federation of Women's Clubs. Smokey Bear

plaque awards (for State or regional achievements) were made to: Seaboard Air Line Railroad; Henry Norton, Forester, Feather River Lumber Co., Reno, Nev.; and the Salt Lake City Junior League.

Smokey Products Hit 10-Year High

Receipts from fees and royalty payments for use of Smokey Bear's name and character on educational items reached $53,586.19 for fiscal year 1964—the highest annual receipts since 1954.

Southern CFFP Program

The special program aimed at incendiarism and careless debris burning in the South received increased exposure in 1964. In March a public meeting in New Orleans stimulated unprecedented activity in forest fire prevention in that area. Outstanding creative work by the volunteer advertising agency Liller, Neal, Battle & Lindsey of Atlanta earned a merit award for the 1963–64 Southern CFFP Campaign from the 1964 Southeastern Art Director's Exhibition. SCFFP is credited with helping to change public opinion within areas formerly without protection from forest fires; additional financing is now being received to extend organized fire protection on several million acres each year.

FOREST PEST CONTROL

Defoliating Insect Control

Detection surveys revealed that spruce budworm infestations of varying population densities occurred on approximately 4 million acres of mixed conifer forests in Maine, Minnesota, Montana, Idaho, and New Mexico. To prevent severe damage to forest resources where infestations were the heaviest and resource values the highest, 50,000 acres of private land were aerially sprayed in Maine; 527,000 acres on the Salmon National Forest in Idaho; and 156,000 acres on the Lolo and Deerlodge National Forests in Montana. During these operations, which were closely monitored by the Forest Service and cooperating Federal and State agencies, extensive precautions were taken to prevent damage to wildlife, fish, range, and other resources.

The larch casebearer continued to spread in western Montana, northern Idaho, and northeastern Washington. Large numbers of an effective parasite were introduced into infested larch stands for biological control.

Surveys showed serious outbreaks of Douglas-fir tussock moths in California, Oregon, and Idaho. The degree of natural control is being determined in these infestations. If natural factors are insufficient to keep infestations in check, direct control will be necessary in 1965.

Bark Beetle Control

Good progress was made in controlling extensive outbreaks of tree-killing bark beetles by chemically treating, logging, or burning infested trees. Nationwide, over 1 million trees were burned or treated with chemicals. These control measures, plus concerted salvage logging, have checked the Mother Lode epidemic in California, the threat of a major epidemic in the Pacific Northwest caused by the extensive 1962 blowdown in Douglas-fir, the longstanding infestation on the Wasatch National Forest in Utah, and the widespread infestations that developed in 1962 and 1963 in parts of the South and Southeast. Special control efforts will be needed in 1965 against epidemics in the Black Hills of Wyoming and South Dakota, and the Targhee and Teton National Forests in Idaho and Wyoming.

White Pine Blister Rust

Antibiotic fungicide treatment to cure infected trees and ribes eradication to prevent spread were the suppressive measures used again in 1964. In northern Idaho, infected western white pine stands on about 115,000 acres were treated by applying antibiotic fungicides to foliage by aircraft or to the basal stem by ground equipment. In the Northeastern, North Central, and Pacific Coast States, about 3 million acres were covered by systematic sampling surveys to locate stands in need of treatment and to plan control action. Also, approximately 8.5 million ribes were destroyed on over 200,000 acres in these States to prevent spread of the disease.

Dwarfmistletoe and Oak Wilt

Control of dwarfmistletoe is done mostly through timber harvesting and timber stand improvement activities; however, this control depends on surveys to show the distribution and intensity of the disease. About 300,000 acres on National Forests were examined for this purpose.

The Federal-State cooperative oak wilt control program, formerly carried on in six States, was curtailed in 1964. This curtailment was decided upon after comprehensive review of a 5-year study indicated the degree of effectiveness of available control methods. Surveys and destruction of infected trees were continued in Pennsylvania, Virginia, and West Virginia, and discontinued by mutual consent in Arkansas. In Kentucky and North Carolina, surveys only were continued on a cooperative basis. In total, over 30 million acres were aerially surveyed and about 4,000 infected trees destroyed.

Other Control Activities

Evaluation and screening of chemicals were intensified to find nonpersistent pesticides for controlling forest insects. Nonpersistent materials showing promise in the laboratory were pilot tested under operating conditions in the field.

Aerial insecticide application methods were modified to insure correct placement and dosages in sensitive areas. Fourteen percent of all spray-

ing was done by helicopter to minimize drift of insecticides into water and onto agricultural land. Strips of land near watercourses were left untreated; dosage rates were reduced near sensitive areas; and supervision of project operations was intensified to reduce possible accidental dumping, misplacement, and overdosage.

To establish and verify the effectiveness of precautions and safeguards taken in aerially applying insecticides, samples of fish, wildlife, meat, milk, and water were analyzed before, during, and after spraying operations to determine amounts and effects of insecticide residues present. Evidence indicates that buildup of residue in fatty tissues is a temporary condition—reduced to a trace a year later in deer and elk.

Insect and disease control on non-Federal forest lands was strengthened by new Federal-State cooperative programs. A model cooperative agreement was drawn up to establish with States a continuing program of surveys and control on non-Federal land. Twelve States organized programs under provisions of the new agreement. Six more are ready to organize such programs as soon as agreements can be completed and funds are available.

FLOOD PREVENTION AND RIVER BASIN PROGRAMS

The Forest Service promotes flood prevention and watershed protection under several programs: the Flood Control Act of 1944, pilot watershed projects authorized in 1954, and the Small Watershed Program under Public Law 83–566, as amended. In assisting with, planning, or carrying out forestry measures under these programs, the Forest Service cooperates with local project sponsors, the Soil Conservation Service, State Foresters, and other Federal, State, and local agencies. It acts directly to apply emergency flood prevention measures on non-Federal and National Forest lands. The Forest Service also cooperates with other Federal agencies and State governments in the conduct of comprehensive river basin studies for the development of water and related land resources.

Flood Prevention Projects

Work continued on the forestry and fire control aspects of seven flood prevention projects authorized under the Flood Control Act of 1944. During the year, 38.1 million trees were planted on eroding flood source lands. This planting, 94 percent of which was on the Yazoo-Little Tallahatchie projects in Mississippi, was done through the combined efforts of the Forest Service, Soil Conservation Service, Agricultural Stabilization and Conservation Service, Corps of Engineers, local soil and water conservation districts, and landowners.

Technical forestry assistance was given to 13,010 landowners and operators in correcting undesirable watershed conditions on private land. This action led to improved forest management on 119,750 acres and the stabilization of 18.5 miles of sediment-producing roads.

Fire prevention and control continued to be strengthened on 2,871,000 acres of private and National Forest lands within the project areas by the construction of 43 miles of fire control roads and trails and firebreaks and six additional buildings for fire crews and equipment on critical watersheds. Other flood control measures included the stabilization of 46 miles of skid trail and logging roads; construction of 29 channel barriers to stabilize stream channels and adjacent slopes on the Los Angeles River project in California; and construction of 6 channel control structures—stabilizing walls, groins, and weirs—on National Forest land in Virginia in the Potomac River Project.

Pilot Projects

The watershed demonstration or pilot program on 58 small watersheds authorized in 1953 is completed except for one project. Thirty-eight landowners received technical forestry assistance in 1964; trees were planted on 131 acres and 2,000 acres were put under management plans.

Public Law 566 Projects

Watershed protection and flood prevention projects are started under the Watershed Protection and Flood Prevention program of 1954 (Public Law 566) by local groups which receive planning, technical, and installation assistance from Federal and State agencies under the general leadership of the Soil Conservation Service.

During 1964 the Forest Service worked with State Foresters, the Soil Conservation Service, and local sponsors in planning watershed protection and flood prevention improvements on 112 small watersheds. Work plans were approved and installations authorized on 96 new projects; 57 of these include accelerated programs for improvement of forest lands.

Forestry measures were installed on 189 projects. More than 13 million trees were planted on 12,384 acres of privately owned land. Technical forestry assistance for watershed improvement was given to 3,367 landowners involving 224,328 acres, and protection from forest fire was extended or strengthened on 670,000 acres. Other watershed improvements included hydrologic stand improvement and protection from grazing damage on 92,500 acres.

Public Law 566 improvements on National Forest lands included revegetation on 630 acres by grass seeding and tree planting; stabilization of 5 miles of eroding gullies; and 28 miles of roadside erosion control.

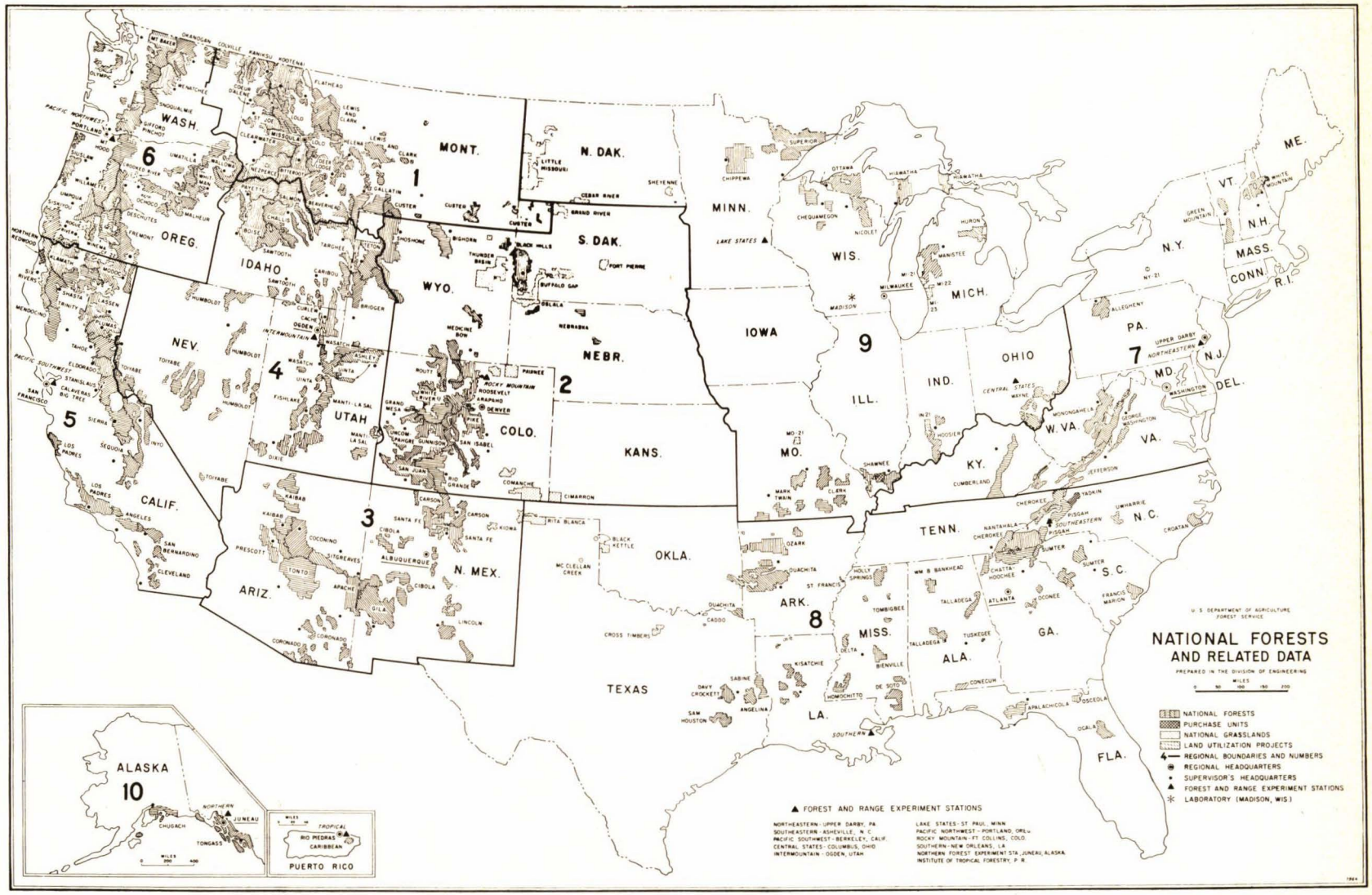
Emergency Flood Prevention

Emergency watershed treatments were applied on three recently burned-over areas within and

adjacent to National Forest lands in southern California. This work was done to minimize downstream hazards to life and property from flood water runoff and debris flows which may follow the destruction of vegetative cover on the watersheds. Included in the treatment was aerial seeding of 69,420 acres to quick-growing grass to provide an immediate protective cover over most of the burned areas. The Soil Conservation Service, the State, counties, landowners, and private organizations cooperated in these efforts.

River Basin Surveys

The Forest Service cooperated with the Soil Conservation Service, the Economic Research Service, and State agencies concerned in continuing studies of water and related land resources in many river basins throughout the country. These studies included cooperative surveys with the Corps of Engineers and the Bureau of Reclamation in 18 river basins and with State water resource agencies in water resource inventories and problem analyses in 10 States.


NATIONAL FORESTS
AND RELATED DATA
PREPARED IN THE DIVISION OF ENGINEERING
U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NATIONAL FORESTS
PURCHASE UNITS
NATIONAL GRASSLANDS
LAND UTILIZATION PROJECTS
REGIONAL BOUNDARIES AND NUMBERS
REGIONAL HEADQUARTERS
SUPERVISOR'S HEADQUARTERS
FOREST AND RANGE EXPERIMENT STATIONS
LABORATORY (MADISON, WIS.)
▲ FOREST AND RANGE EXPERIMENT STATIONS
NORTHEASTERN - UPPER DARBY, PA.
SOUTHEASTERN - ASHEVILLE, N. C.
PACIFIC SOUTHWEST - BERKELEY, CALIF.
CENTRAL STATES - COLUMBUS, OHIO
INTERMOUNTAIN - OGDEN, UTAH
LAKE STATES - ST. PAUL, MINN.
PACIFIC NORTHWEST - PORTLAND, ORE.
ROCKY MOUNTAIN - FT. COLLINS, COLO.
SOUTHERN - NEW ORLEANS, LA.
NORTHERN FOREST EXPERIMENT STA., JUNEAU, ALASKA
INSTITUTE OF TROPICAL FORESTRY, P. R.
ALASKA
10
PUERTO RICO
RIO PIEDRAS
CARIBBEAN
TROPICAL
1964

THE NATIONAL FOREST SYSTEM. The Forest Service is responsible for managing, developing, and protecting 186 million acres of land and its resources in the National Forest System. This includes 154 National Forests in 39 States and Puerto Rico, containing 182 million acres; 3.8 million acres of National Grasslands; and 160,000 acres of land utilization projects. Under multiple use and sustained yield, these lands are administered for their five basic resources: Outdoor recreation, range, timber, water, and wildlife.

National Forest Management and Protection

On October 1, 1964, the Coyote Fire on the Los Padres National Forest, Calif., was brought under control. This was the end of a 10-day struggle involving as many as 3,000 men; 67,000 acres of vital watersheds were blackened. Damage was estimated at $20 million. This was also the beginning of a new struggle to restore the land, to prevent floods, and to make the area an example of how well the land can serve man.

Even before the fire, the Santa Ynez River drainage had been marked for intensive watershed management, but as a burned-over wasteland it needed the planned treatment and much more, lest winter rains sweep mud and rock into downstream reservoirs. The Forest Service launched a massive effort not only to ward off imminent floods, but to alter the land permanently to new vegetative types that will increase water yields, pose less of a fire hazard, and be more useful for recreation, livestock, and wildlife. Grass firebreaks were constructed along key ridges, debris dams were built above reservoirs, the burn was reseeded, and measures were taken to prevent brush from returning where it was not wanted. The extensive emergency work was completed December 11, just ahead of the heavy rains that caused disastrous floods in the Pacific Northwest.

This was but one of many operations that go into the management and protection of the "lands of many uses," the 154 National Forests and 19 National Grasslands in 41 States. These lands constitute 186 million acres of natural resources—wood, water, wildlife, forage, and recreation—that are managed for the public benefit according to the principles of sustained yield production and multiple use.

Such management is directed by the Multiple Use-Sustained Yield Act of 1960, and is translated into action by means of multiple use guides and plans for Regions, Forests, and Ranger Districts. These plans and guides are developed from analyses of existing and potential resources as related to projected public needs. They establish a pattern of coordinated uses for defined management zones, and compose the framework within which detailed operations are planned and carried out.

WATERSHED MANAGEMENT

Watershed management on National Forests assumes ever-increasing importance as demand grows each year for more high-quality water for domestic, industrial, and farm use. This is particularly true in the 11 western States where more than 50 percent of the water supply flows from the National Forests. In 1964, primary emphasis was on extending application to National Forest watershed management of the scientific knowledge that has been developed by many years of research.

Policy and Directives

To further the application of scientific watershed management to operational programs to improve water yield and quality, the watershed section of the Forest Service Manual was rewritten during the year. In addition, a review draft of the Soil Handbook was completed, and more than half of the Watershed Hydrology and Water Resource Management Handbook was rewritten and submitted to the field for review.

Policy and management objectives for municipal watershed management were prepared. The aim is to improve the multiple use capability of the 40 million acres of National Forest land within municipal watersheds, while adhering to their basic requirement for production of high-quality water supplies.

An important step toward improved management was the revision of the interdepartmental agreement concerning the management of land resources associated with U.S. Army Corps of Engineers water development projects and the concurrent decision on the administration of 22 major projects installed or under construction. This agreement will help increase efficiency of Federal operations in areas affected by the projects.

Applying the Knowledge

The significance of the new program can be seen on important watersheds of 40 National Forests where watershed scientists are translating research findings into operational practices. These men have made hydrologic analyses, have prepared management prescriptions to meet specific objectives for water yields in terms of quantity, quality, and timing. The watersheds range typically from 50,000 to 100,000 acres in size, and the practices applied include: snow fencing or timber cutting in patterns to increase the depth of snowpack and to improve volume and timing of snowmelt runoff; converting vegetative cover from brush to grass to increase water yield and to improve other resource values; identifying sources of pollution and prescribing methods to reduce it; and developing plans for rehabilitation of eroding areas.

Of particular significance is the Lake Creek watershed in the San Isabel National Forest, Colo., where snow fences have been installed for large-scale manipulation of snowpack to increase water yields. On the Salt and Verde River drainages in Arizona, the results of a pilot project for water yield improvement have been so encouraging that it is being extended to other National Forest lands in the watersheds. The Forest Service and the Salt River Valley Water Users Association have entered into a cooperative agreement that will permit the association to contribute to the acceleration of the project.

The project for the Santa Ynez watershed in California was another major attempt to manipulate a watershed for improved water yield and quality; however, the Coyote Fire, as described previously, required major changes in the plan and its schedule.

Restoring the Land

Many National Forest areas still reflect damage done to the land many years ago by fire, floods, or abuse, often dating from periods before the establishment of the National Forests. Restoration work on these areas continued at a steady pace, while critical burned areas of the current year were treated to prevent creation of new erosion problems. During the fiscal year 28,600 acres of deteriorated areas were treated to prevent erosion, including 14,800 acres of sheet erosion and 1,344 miles of gullies. Fifty-four miles of eroding streambanks and shoreline were stabilized, providing beneficial effects to a total of 368 miles of streams and lake shores. Nearly 150 miles of stream channels were cleared to prevent bank erosion, and 2,480 miles of abandoned, eroding roads were stabilized. Slightly more than 35,000 acres of burned areas were rehabilitated, including special treatment of 23,757 acres of critical flood and sediment producing areas.

Soil Surveys—An Ounce of Prevention

National Forest soil surveys provide a foundation for management of all the resources and an insurance against costly misjudgment. They show in advance what problems might be encountered in road construction, the type of trees or grass best suited to a particular area, hazards involved in logging or grazing, and possible problems in regenerating timber once the old growth is logged. The skills of soil and watershed scientists were called upon to prepare technical watershed protection specifications for about 800 projects which could have caused serious watershed damage. These included road and highway construction, timber harvest, mining operations, dam construction, and watershed restoration projects.

During fiscal year 1964 standard soil surveys were completed on 1.6 million acres, bringing the total area surveyed to 7 million acres. Reconnaissance surveys covered 2.4 million acres. Ultimately all National Forest lands will be surveyed.

RANGE MANAGEMENT

Grazing Receipts: $3,788,000

Of the 186 million acres in the National Forests and National Grasslands, over 100 million acres are contained in 11,500 grazing allotments. These areas provide forage for about 6 million head of sheep and cattle owned by more than 19,000 ranchers and farmers, in addition to providing timber, recreation, wildlife habitat, and water resources.

The livestock owners hold permits and pay for the grazing on the basis of animal-months use; fees were charged for 1.3 million mature cattle and 2.3 million mature sheep, while other animals, predominantly offspring, were grazed without charge. Receipts from grazing in fiscal year 1964 amounted to $3,788,562, from which 25 percent or $947,140 was paid to the States for the benefit of the counties in which the livestock were grazed.

Because National Forests and National Grasslands provide important seasonal forage, ranch operations and the economy of local communities have been built around the use of these lands. Grazing on the Federal lands enables grazing permittees to make optimum use of an estimated 88 million acres of associated private lands for sustained livestock production.

This combined use of public and private lands makes an important, and often essential, contribution to the income and tax base of many local communities, and helps to stabilize the operation

of farm and ranch properties. It is estimated that National Forest and National Grassland permittees own land, livestock, and buildings valued at $2.1 billion. In addition, combined public and private investments in range management and improvement practices are generating income in local economies, which often contribute materially to the Departments Rural Areas Development program.

Analysis and Development

The Forest Service continued to collect information about range conditions and capabilities through range allotment analysis. About three-fifths of the initial work on the 11,500 grazing allotments has been completed. With the accumulation of knowledge about range conditions and trends, the Forest Service is able to do a better job of administering livestock grazing. Intensive management systems have been installed using the findings of range analysis; some allotments, too large for proper use, have been divided to secure better resource management; other analysis work has shown the feasibility of establishing grazing allotments where none existed before, as in the South.

During fiscal year 1964, analyses of the equivalent of 720 allotments were completed Service-wide. In addition to the initial analysis work, many condition and trend plots were remeasured. Management plans were reviewed in cooperation with permittees to determine changes needed to obtain more effective use of the range. A motion picture, "Range Allotment Analysis," was released, showing how the analysis work is done.

If the range resource is to meet the increased demand for livestock grazing, it must be developed to its full potential for high forage production. For example, some areas need rehabilitation treatment because overstocking or other practices in the past have caused changes in the kinds and amounts of plant cover, growth of overly dense brush stands, the invasion of poor forage plants, and the appearance of barren areas. Lands with these and other deficiencies are being restored to good forage production and watershed condition by proper rehabilitation and management.

Rangeland rehabilitation includes plant control by mechanical means, by application of herbicides, ground preparation and seeding, controlled burning, water spreading, and control of rodents and noxious farm weeds. Combined with these developmental practices has been the application of better ways for grazing the range. Rotation and other management systems are being successfully used in conjunction with range improvement to obtain optimum use of the land for livestock.

Range Improvements

In fiscal year 1964, more than 100,000 acres were revegetated through range seeding; undesirable plants and noxious farm weeds were controlled on some 162,000 acres; rodent control measures were carried out on approximately 25,000 acres; water spreading, fertilizing, and other cultural treatments were applied on an additional 12,500 acres. Construction of improvements included over 2,000 miles of fence, some 380 cattle guards, and approximately 1,900 stock water developments.

These practices were effected through the use of regular appropriations, Accelerated Public Works funds, and contributions by range users. The total program amounted to $4,799,909. This work was accomplished largely by the use of local contractors, labor, and materials. Approximately 20 percent of the funds allocated were expended for maintenance of existing range improvements.

Values of Public Land Grazing

A program of ranch evaluations was continued in cooperation with the Bureau of Land Management and State universities in the West. Substantial progress was made in these studies to provide needed information on the value of public land grazing use to western livestock producers.

A new economic evaluation was begun by the Forest Service on the Sheyenne National Grassland in North Dakota. Members of the Sheyenne Valley Grazing Association are cooperating in this project designed to appraise the contribution of public lands to livestock production and ranch income in the local area.

Progress was made toward implementation of a recently issued Bureau of the Budget "Statement of Principles on Natural Resource User Charges" as it relates to fees to be charged for livestock grazing on Federal lands. The Forest Service is cooperating with agencies in the Departments of Defense and Interior to develop a uniform basis for the establishment of grazing fees.

Range Publications

Several informational publications in the field of range management were produced during the fiscal year. A booklet tells how rangelands are analyzed. A pamphlet contains regulations governing grazing on Forest Service lands together with grazing trespass and appeal procedures. Another publication brought together significant court cases which have been argued and adjudged over the years regarding the authority of the Secretary of Agriculture to permit, regulate, or prohibit livestock grazing on lands administered by the Forest Service.

OUTDOOR RECREATION

Eleven Million More Visits

National Forests continued to draw record numbers of the American people for outdoor recreation. Nearly 134 million visits were made to these Federal lands in 1964, an 11 million increase over 1963. (Complete figures for calendar year 1964 will be available in a statistical supplement to be published in July.)

To accommodate the increasing recreation load, 410 new camp or picnic sites were built during the fiscal year, providing 7,647 additional family units. (A family unit consists of a table with benches, fire grate, parking spot, tent site, water, garbage can, and nearby toilet.)

Many other facilities were built or improved for more specialized sports, both with appropriated funds and through special use permits authorizing construction with private capital.

More Family Camping Facilities

Although a large proportion of National Forest recreation use is dispersed over wide areas and requires only roads, trails, streams, wooded areas, or beautiful scenery, another significant kind—family camping and picnicking—requires developed sites. To accommodate this use it is necessary to provide a family unit for each user party, insofar as this is possible. As a rule, family units are spaced 2 or 3 per acre in groups of 15 to 30, and are served by a loop road from a main highway. The following tabulation shows the increase in the number of such campgrounds and family units during the fiscal year.

CAMP AND PICNIC FACILITIES

	June 30, 1963	*June 30, 1964*	*Increase 1963–64*
Number of developed sites	5, 978	6, 388	410
Area occupied (acres)	34, 039	36, 364	325
Family units available	67, 739	75, 368	7, 647
For tent camping (units)	40, 840	45, 145	4, 305
For trailer camping (units)	5, 910	6, 743	833
For picnicking (units)	20, 989	23, 498	2, 509
Safe capacity at one time (persons)	354, 954	389, 636	34, 682

More Facilities for Other Sports

In addition to the standard facilities needed for camping and picnicking, special facilities are needed to accommodate skiing, organization camping, resort guests, swimming, etc. Much of this use is in structures owned and operated by private individuals or business organizations who pay for the privilege of using the public land under a permit system. The number of such accommodations increased over the previous year as shown below.

RESORTS AND OTHER SPECIAL SITES AVAILABLE

	Number available		
	6/30/63	*6/30/64*	*Net change*
Organization camps	569	573	+4
Hotels, lodges, resorts, and other public service sites	576	611	+35
Winter sports sites	187	196	+9
Swimming sites	219	239	+20
Boating sites	449	516	+66
Observation viewpoints	270	292	+22

Winter Sports Use Grows

Nine new National Forest winter sports sites were opened during 1964 and a number of others reached the negotiation or drawing-board stage. Also, many facilities were enlarged or improved with better equipment; many new ski lifts, tows, and lodges were added. Changes during the fiscal year are tabulated below.

WINTER SPORTS FACILITIES

	6/30/63	*6/30/64*	*Net change*
Number of developed sites	187	196	+9
Area under permit (acres)	34, 797	42, 469	+7, 672
Uphill devices and jumps:			
Chair lifts	111	127	+16
Gondolas	5	7	+2
Platter pulls	54	68	+14
T-bars	73	66	−7
Rope tows	326	343	+17
Ski jumps	41	44	+3
Total	610	655	+45

Visitor Information Service

Public enjoyment of the National Forests is greatly enhanced when the visitors know more about the area they are visiting—history, geology, animal and plant life, and the way the area is managed. The Visitor Information Service is providing this type of help for visitors through a variety of interpretive programs at heavily visited National Forest areas.

Special emphasis was given during the year to the smaller interpretive facilities. This included maintenance and development of interpretive trails, demonstration areas, vistas, overlooks, and wayside exhibits. Guided walks, programs, and other personal contacts by forest officers were intensified at major recreation areas.

Visitor information centers are being developed at areas with outstanding attractions for National Forest visitors. With the dedication of the Sabino Canyon Visitor Center in the Coronado National Forest, Ariz., on June 13, 1964, there were four centers in operation. The other centers are located at Mendenhall Glacier, Tongass National Forest, Alaska; Missoula Smokejumper and Fire Research Center, Missoula, Mont.; and Redfish Lake, Sawtooth National Forest, Idaho.

The cornerstone was laid in October for the Cradle of American Forestry Museum in the Pisgah National Forest, N.C., at the site of America's first forestry school and in the area where scientific forestry was first practiced in this country. Construction was nearly completed on the Red Canyon Visitor Center, Ashley National Forest, Utah. The Voyageur Visitor Center within the Superior National Forest, at Ely, Minn., is completed and will be open with the beginning of the 1965 season.

The Forest Service is also cooperating with other Federal, State, and local agencies in interpretive services at a number of locations. Cooper-

ative efforts with the Bureau of Reclamation, Department of the Interior, are in progress at Hungry Horse Dam, Mont.; Flaming Gorge Dam, Utah; and the Trinity Reservoir, Calif. The Forest Service is also cooperating with the National Park Service in a project at the Gila Cliff Dwellings National Monument within the Gila National Forest, N. Mex.

A National Wilderness System

The Wilderness Act (Public Law 88–577), signed by President Johnson on September 3, 1964, created a national wilderness preservation system composed of federally owned areas designated by Congress as "Wilderness" areas. Initially the act applies to the 9.1 million acres in 54 units of National Forest lands previously designated under regulations of the Secretary of Agriculture as "Wilderness" and "Wild" areas and the Boundary Waters Canoe Area.

Under the act these areas are to continue to be administered by the Forest Service of the Department of Agriculture in much the same way as they have been in the past. The act also provides that 34 other National Forest units, the "Primitive" areas, are to be reviewed within 10 years for their suitability for inclusion in the national wilderness preservation system. Other suitable lands administered by the Department of Agriculture, Forest Service, as well as those administered by the Department of the Interior, may be added to the system by act of Congress.

Acts of Congress and regulations of the Secretary of Agriculture relating to the Boundary Waters Canoe Area will continue in effect, as specifically provided in the Wilderness Act. This unique area within the Superior National Forest, Minn., will remain a center for primitive canoe recreation, while at the same time providing other resource uses in specified zones within the boundaries of the area.

Special Study of Boundary Waters Canoe Area

A special committee appointed by the Secretary studied the entire Boundary Waters Canoe Area and its management over a 9-month period in 1964, and recommended a number of changes. On January 12, 1965, the Secretary announced his decision accepting most of the recommendations, which included the following provisions:

—To extend the "no-cut" zone (where no timber harvesting is permitted) to include an additional 150,000 acres, with an additional 100,000 acres to be added as opportunity permits. (This would place about two-thirds of the entire area in the "no-cut" zone.)

—To control recreation use more closely so as to protect the area's primitive environment.

—To manage some 22,000 acres outside the Boundary Waters Canoe Area in the same manner as the "no-cut" zone within the area.

—To zone lakes according to boat motor sizes, establish a no-motor zone, and prohibit motorized equipment at all but a few portages.

—To review mining activities in the Canoe Area and to refuse to consider future applications for mineral prospecting there except in cases of national emergency.

—To plan for a system of registering visitors and licensing outfitters.

Wilderness Actions

Between January 1, 1964, and the signing of the Wilderness Act, several important actions were taken in the classification of wilderness-type areas under Secretary of Agriculture's Regulations U–1 and U–2. The net effect was the enlargement of one established area and the addition of three former Primitive Areas and one new area to the system of Wilderness and Wild Areas; these were subsequently incorporated into the national wilderness preservation system under the act. The following actions were taken during the 8-month period preceding the new law.

	Net area (acres)
Reclassification:	
High Sierra Primitive Area, Inyo and Sierra National Forests, Calif., changed to John Muir Wilderness, Apr. 27, 1964	502,978
High Sierra Primitive Area, portion not reclassified	13,000
South Warner Primitive Area, Modoc National Forest, Calif., changed to South Warner Wild Area, June 8, 1964	68,507
Cabinet Mountains Primitive Area, Kaniksu and Kootenai National Forests, Mont., changed to Cabinet Mountains Wild Area, June 26, 1964	94,272
New area added:	
Shining Rock Wild Area, Pisgah National Forest, N.C., May 7, 1964	13,400
Name changed and area enlarged:	
Mt. Zirkel-Dome Peak Wild Area, Routt National Forest, Colo., changed to Mt. Zirkel Wild Area, July 28, 1964	72,180

The John Muir Wilderness was so named in honor of the famous naturalist-writer and advocate of wilderness preservation of the late 19th and early 20th century, and includes much of the area associated with Muir's wilderness travels. The reclassification action added approximately 108,000 acres to the former Primitive Area.

The new Shining Rock Wilderness is located along the Blue Ridge in western North Carolina, in an area of unique vegetative cover, many streams and waterfalls, and outstanding deer and bear populations. The area is dominated by Shining Rock, a gleaming mountaintop of white quartz.

The extent of Wilderness and Primitive Areas in each State at the end of the year is shown in the table that follows.

State	Wilderness Areas		Primitive Areas		Net area in both classes
	Units	Net area	Units	Net area	
	Number	*Acres*	*Number*	*Acres*	*Acres*
Arizona	5	422, 990	[1] 4	250, 936	673, 926
California	13	1, 256, 884	8	563, 152	1, 820, 036
Colorado	5	274, 859	6	554, 283	829, 142
Idaho	[1] 1	987, 910	3	1, 642, 388	2, 630, 298
Minnesota	1	886, 673			886, 673
Montana	[1] 5	1, 482, 567	4	417, 140	1, 899, 707
Nevada	1	64, 667			64, 667
New Hampshire	1	5, 400			5, 400
New Mexico	5	678, 661	[1] 3	335, 424	1, 014, 085
North Carolina	2	21, 055			21, 055
Oregon	9	662, 847	1	86, 700	749, 547
Utah			1	240, 717	240, 717
Washington	3	583, 196	1	801, 000	1, 384, 196
Wyoming	4	1, 812, 012	4	586, 000	2, 398, 012
Total	54	9, 139, 721	34	5, 477, 740	14, 617, 461

[1] Includes unit also located in adjacent State. Total adjusted.

SPECIAL USES AND MINERALS

National Forests and National Grasslands serve many other uses in addition to those related to renewable natural resources. These uses cover the whole spectrum of public land uses—from airport beacons to apiaries, from wayside stands to winter resorts. These developments are authorized by special use permits issued to the individuals, business establishments, civic groups, and government agencies that operate them. The number of permits and the fees paid for them have been increasing steadily in recent years; from 78,000 permits in 1963 to 79,000 in 1964, with a $338,871 increase in receipts to a total of $2,248,345 paid into the U.S. Treasury during fiscal year 1964.

Determination of Surface Rights to Mining Claims

The multiple use mining law of 1955 provided that existing mining claims within the National Forests be examined under certain procedures to discover whether their claimants were properly entitled to the surface values as well as to the subsurface mineral values, or if the surface rights should be in public ownership. This task involved approximately 1,200,000 claims covering 24 million acres scattered over 160 million acres of National Forests. Progress during 1964 brought the task to within 10 percent of completion.

Millions in Mineral Revenues

Lease of 4,463,550 acres of acquired National Forests and National Grasslands for oil and gas exploration and development, and other leases on 722,317 acres of acquired and other lands for other forms of prospecting brought into the U.S. Treasury $3,433,918 in revenues during fiscal year 1964. This was an increase of more than half a million dollars in receipts over last year. Revenues came from rents and royalties for 5,360 oil and gas leases and from 1,275 permits and leases for coal and "hard-rock" minerals, for sand and gravel and other common varieties of mineral materials, and for seismographic and other geological and geophysical explorations.

Another 10,700,000 acres of land in the National Forest System was under oil and gas lease and 327,000 acres under coal, phosphate, sodium, or other mineral prospecting permit or lease under the Mineral Leasing Act of February 25, 1920, governing mineral development on lands reserved from the public domain. Revenue attributable to such mineral development in the National Forest System for fiscal year 1964 was approximately $16 to $17 million.

Outstanding Mineral Rights

Management of many areas of acquired National Forests and National Grasslands is complicated by the reservation of mineral rights to the previous owners or to third parties when the United States purchased the lands. In 1964 mineral exploration and development operations involved about 52,000 acres under deeds that reserved mineral rights. Other mineral rights are being exercised under mineral deeds that separated the surface and mineral rights before the United States purchased the land. Control of the surface resources is often governed by the deed separating the mineral from surface ownership and is subject to State laws. Protection against pollution and the destruction of other resources also depends heavily on State laws, particularly where minerals are removed by strip-mine methods. Several States have recently enacted or strengthened laws relating to coal strip mining and air and water pollution.

Cooperative Coal Recovery Study

The cooperative coal recovery study project that began in early summer of 1963 on the Allegheny National Forest, Pa., is progessing satisfactorily. Preplanning has been successful; only minor adjustments in methods of operation are required from time to time.

Stripping is proceeding from west to east in arc-shaped slices with a maximum rise of 300 feet. The strip cut is 40 to 45 feet wide. "Swell" of overburden, after excavation, is estimated at 20 to 30 percent. Nineteen acres disturbed or to be disturbed are under bond to guarantee performance. The operator is making his fifth cut; the maximum high-wall height is 54 feet.

Dry Hole on the Kaibab

A test well drilled in the spring of 1964 for oil near Jacobs Lake, Ariz., on the North Kaibab resulted in a dry hole with a total depth of 3,880 feet. Operations were discontinued. The site has been satisfactorily restored as required by the stipulations carefully prepared to protect the recreational, scenic, and wildlife values of the approximately 400,000 acres of the North Division of the Kaibab National Forest leased for oil and gas exploration purposes.

TIMBER MANAGEMENT

Another Record Timber Harvest

Timber harvested from National Forests in fiscal year 1964 again set a new record: 11 billion board feet. This exceeded the previous record in 1963 by 1 billion board feet.

Cash receipts from timber came to $128 million—up $10.6 million over last year's figure.

The record harvest included more than a billion board feet of timber salvaged from areas heavily damaged by the October 1962 windstorms in the Pacific Northwest. By the close of fiscal 1964, more than two-thirds of the National Forest timber damaged in the storms had been salvaged.

Demand Remained High

Demand for timber, though slightly lower than for the previous year, remained strong. A total of 11.7 billion board feet of timber was sold out of a total of 12.2 billion board feet offered for sale. The volume sold was 500 million board feet lower than in the previous year.

The revision of the timber sale contract terms is reported on page 2. Also, a National Forest Log Scaling Handbook was completely rewritten, field tested, and made available to the public through the Superintendent of Documents, Government Printing Office.

Harvest Nears Allowable Cut

Progress in harvesting the allowable annual cut from the National Forests is shown below for selected years:

	Sustained-yield allowable annual cut [1] *(Billion board feet)*	*Actual cut (Billion board feet)*	*Percent of allowable cut harvested*
Fiscal year:			
1958	9. 6	6. 4	67
1960	10. 0	9. 4	94
1962	10. 5	9. 0	86
1963	11. 3	10. 0	88
1964	12. 0	11. 0	92

[1] As of January 1 preceding the beginning of the fiscal year. This is the basis for program planning and financing. Allowable annual cut includes only sawtimber for National Forests west of the Great Plains and in Alaska, and sawtimber and convertible products for the eastern National Forests.

Timber Inventories and Plans

During the fiscal year major timber management plan revisions were approved for 18 working circles. These covered 7,041,000 acres of commercial forest land and established allowable annual cuts of 832 million board feet of sawtimber and 70 million cubic feet of other products. A major achievement was the development of a more detailed and efficient control record, programed for ADP by the Statistical Reporting Service. A national standard method of taking and summarizing inventory data was adopted for the Forest Survey and the National Forests. A Service-wide training meeting in compartment management was held.

Reforestation Progress

Major reforestation and stand improvement work done in fiscal year 1964 is indicated in the following table.

Type of work	Financed from—			
	Forest land management appropriation	Deposits by timber purchasers [1]	APW funds [2]	Total area
	Acres	*Acres*	*Acres*	*Acres*
Planted	87, 687	83, 627	3, 043	174, 357
Seeded	14, 182	19, 113	210	33, 505
Natural regeneration on prepared sites	3, 069	9, 634	------	12, 703
Release and weeding	95, 648	219, 161	23, 037	337, 846
Thinning	56, 468	66, 358	5, 843	128, 669
Pruning	1, 945	9, 090	2, 279	13, 314

[1] Deposits by timber purchasers under the Knutson-Vandenberg Act of June 9, 1930 (16 U.S.C. 576b).
[2] Accelerated Public Works program.

Building the Young Forest

Natural regeneration was accomplished on 128,133 acres following prescribed cutting designed to promote reforestation without supplemental

treatments. Mechanical site preparation was completed on 146,876 acres to be planted or seeded in 1965. Rodent and animal control, including fencing, was used to some extent in all regions to protect young trees from animal damage. In the southern pine region, over 30,000 acres were control burned to protect longleaf pine reproduction from brown-spot disease.

Forest Service nurseries at 16 locations produced 106 million trees. In addition, 18 million trees were grown for Forest Service use under contract at State nurseries. The year's tree seed harvest totaled 79,836 pounds. Forest Service extractories processed 49,721 pounds, and 30,115 pounds were purchased under contracts for clean seed from dealers. Some new seed production areas and seed orchards were established, but most of the work was development and expansion of seed orchards established in previous years.

Nearly half a million acres of young timber stands were given various stand improvement treatments, principally release, weeding, and thinning, to increase growth and improve quality. Under the APW program, 3,253 acres were reforested and 31,159 acres were given timber stand improvement.

Efforts were continued to have more work done by contract. A shortage of competent contractors exists in some areas; considerable time and effort are being spent to develop contracting interest and capabilities among local people.

The following tabulation compares the 1964 and 1963 contracting records.

	Acres contracted		*Percent of total*	
Kind of work	*1963*	*1964*	*1963*	*1964*
Planting	51, 264	50, 704	28	29
Seeding	11, 838	14, 318	29	43
Site preparation	56, 897	69, 905	46	47
Release and weeding	5, 701	17, 917	2	5. 3
Precommercial thinning	9, 775	19, 964	7	16
Pruning	100	678	. 4	5

A Service-wide work conference on reforestation and tree improvement was held in Alexandria, La., in October. Proceedings were compiled and printed for general distribution to the field.

WILDLIFE MANAGEMENT

Wildlife is a product of the land, and its distribution and abundance depend to a large extent on the condition of the land, the physical environment which constitutes the habitat. National Forests and National Grasslands contain within their boundaries choice habitats for many species of mammals, birds, and fishes. These forms of wildlife contribute much to the overall enjoyment of people who use the out of doors for recreational pursuits.

Planning: A Requisite to Management

Current emphasis is being given to the development or updating of wildlife habitat management plans, which are developed cooperatively with the States. These plans guide on-the-ground efforts to protect and improve wildlife resources, and promote continuity in the management of wildlife and its habitat.

Wildlife plans are coordinated with multiple use plans and conformed to regional multiple use guides which prescribe coordinating policies in each Region. An essential part of wildlife planning is the maintenance of a priority job list or current action program. This helps insure timely accomplishment of the most urgent and most productive jobs.

This planning extends to the protection of endangered species. The Forest Service is playing a key role with other conservation agencies in the national effort to identify and protect wildlife species threatened with extinction. This continuing program is currently receiving national emphasis.

Unforeseen Impacts on Habitat

The catastrophic Alaskan earthquake in 1964 made profound changes on parts of the big-game ranges, the Copper Flats waterfowl area, and some of the major salmon-producing streams. The affected areas either dropped several feet so as to flood dry-land game ranges and to cover freshwater salmon spawning areas at the mouths of streams with sea water, or they were raised several feet so that some waterfowl wetlands became high and dry. Earth movements also caused sedimentation damage to some salmon spawning streams. The net effect of this major land disturbance on various forms of wildlife will not be known until after several years of observation and study. Direct habitat improvements to help mitigate these natural losses will be applied to the land as their need is determined.

Direct Habitat Accomplishments

The following listed habitat improvements were completed during the fiscal year on National Forests and National Grasslands. Financed in part under the Accelerated Public Works program, these improvements increase the wildlife carrying capacity of the lands so treated.

Wildlife food and cover improvements:		
Permanent openings	7, 009	acres
Prescribed burns	36, 020	acres
Seeding and planting	14, 476	acres
Release of forage plants	6, 500	acres
Protecting key game areas	3, 359	acres
Small water developments for wildlife:		
Ponds, troughs, guzzlers, etc	1, 551	items
Fish stream improvements:		
Bank stabilization and barrier removal	91	miles
Stream improvement structures	296	miles
Protecting stream channels	328	miles
Lake improvements for fish:		
New fishponds constructed	75	acres
Water level and bank stabilization	111	acres
Waterfowl lakes and marshes constructed	1, 373	acres (31 areas)

Public use and enjoyment of wildlife resources also benefited directly from the construction of 436 miles of trails, 140 miles of roads, 133 new parking areas, and 35 new boat ramps.

As wildlife plays an ever-increasing role in the recreational use of the National Forests, efforts must be continued and strengthened to coordinate nearly all resource uses and activities with the management of wildlife habitat—for nearly all have a direct effect on wildlife populations and their habitats. Greatest emphasis is being placed on conserving existing wildlife resources, to which is added the rehabilitation of damaged or depleted habitats.

FIRE CONTROL

1964 Fire Season

The eastern and southern parts of the country had a near-normal fire season in 1964, despite a severe drought that persisted into late fall. The central Rockies, the Southwest, and California had severe fire weather for several months. The northern Rocky Mountains and the Pacific Northwest had a below-normal fire season. Storms in early November ended the fire season in most areas of the country.

One of the largest and most damaging fires in 1964 started on the Los Padres National Forest near Santa Barbara, Calif., on September 22. Driven by strong Santa Ana winds, it was finally controlled on October 1, after burning 67,000 acres. Damage from the fire was estimated at more than $20 million.

The number of man-caused fires on National Forests was reduced from 6,269 in 1963 to an estimated 5,097 in 1964. The 1964 record compared favorably with the 5-year average of 5,191. While this immediate downward trend is encouraging, the number of man-caused fires has generally been increasing since 1957. The national goal is to reduce man-caused fires on National Forest lands to 3,500 per year by 1970.

Preventing National Forest Fires

The Forest Service further emphasized fire prevention activities during the year with a national fire prevention and law enforcement training school, held at Continental Divide, N. Mex. Fire leaders from all Regions, other Federal and State agencies, and Canada attended. The school emphasized problem solving and decisionmaking, related to the prevention of man-caused fires.

A notable result of the training given was a speedup in fire trespass case reporting and processing. Fifty-four cases were successfully closed in 1964, compared to 12 in 1963.

Fire prevention demonstration areas were established on selected National Forests to try out new approaches and new ideas in fire prevention. Prevention techniques developed through research will be tested in these areas before being given widespread use. An aid in prevention is a new spark arrester guide for all field personnel who inspect internal combustion equipment. This guide will help fieldmen to detect serious fire hazards from poorly guarded engine exhausts.

National Fire Danger Rating System

The first phase of the National Fire Danger Rating System was put into use in most Regions in 1964. This provides a uniform system, so that all personnel need learn only one system, and affords a sound basis of comparison between areas.

Firefighting Fatal to Five

Five men lost their lives during 1964 in firefighting. Two air tanker pilots and a helicopter pilot were fatally injured in aircraft crashes, and two firefighters were killed on the fireline.

Air Operations

The superiority of aircraft in fire detection has led to the substitution of fixed lookouts by air patrols in many areas, particularly in the Pacific Northwest and the Southeast. A task force study of the best method of obtaining air tanker service has led to a new policy, which provides for negotiated contracts for air tankers. Preliminary investigations have shown many possibilities for one-man helicopters in Forest Service work, and extensive field trials have been conducted with large helicopters for possible use as helitankers and transport aircraft for cargo and personnel.

Two studies are underway on the use of aircraft at night. In Missouri, fixed-wing aircraft flew night detection patrols in an attempt to detect incendiary fires more quickly, and in Montana, night flying of helicopters in mountainous country was shown to be feasible.

Plans were completed for new facilities for an interagency air attack base at West Yellowstone, Mont.; and the Redmond, Oreg., Air Center was formally opened in September 1964.

Fire control officers worked closely with Forest Service engineers at equipment development centers in the design and testing of improved fire control equipment, described later.

ENGINEERING

The Forest Service uses a wide range of engineering skills in the administration of National Forests. Engineers plan and design roads, trails, bridges, buildings, and other facilities; make surveys and maps; plan and supervise water developments; design and construct signs; and work to improve equipment.

Earthquake and Floods

Forest Service engineering operations were heavily taxed in several areas as the result of natural calamities. In early June floods hit Idaho and Montana, causing $8.9 million worth of damage to forest development roads, bridges, and

trails. The Lewis and Clark National Forest had the most damage. The Good Friday earthquake in Alaska caused $350,000 damage to roads and trails, primarily on the Chugach National Forest, and damaged other resources.

During Christmas week disastrous floods occurred in northern California, Oregon, Washington, Idaho, Montana, Utah, and Nevada. Damage to forest roads, trails, and bridges was estimated at $49 million. Recreation facilities and resource operations were also severely affected by the floods. This included damage to 653 family camp and picnic units and 73 other recreation developments. Much engineering work will be required to repair the damage from these disasters.

Roads and Trails

As of June 30, 1964, National Forests were served by a transportation system consisting of 193,863 miles of forest development roads, 104,656 miles of trails, and 429 landing fields for fixed-wing aircraft. Regular funds for forest roads and trails financed construction during the fiscal year of 744 miles of new roads and reconstruction of 780 miles of existing roads to higher standards necessary for more intensive use. In addition, 611 miles of roads were constructed or reconstructed with Accelerated Public Works funds. Purchasers of government timber constructed 3,110 miles and reconstructed 1,126 miles of roads on the forest development road system.

Other improvements included construction or replacement of 252 bridges, 653 miles of new or improved trails, and improvement of 4 fixed-wing aircraft landing fields. Funds obligated for maintenance, construction, and reconstruction by the Forest Service, including APW funds, totaled $87.8 million. The 4,237 miles of roads constructed or reconstructed by timber purchasers were appraised at $51 million, and maintenance of 19,099 miles at $6.1 million.

Vehicles and Construction Equipment

During the year the Forest Service owned, operated, and maintained a fleet of 11,509 vehicles, 603 crawler tractors and loaders, and over 1,600 other items of equipment. The fleet of motor vehicles logged more than 90 million miles in support of Forest Service work programs. During peak workload periods the Forest Service supplemented its fleet with more than 750 trucks and automobiles maintained by the General Services Administration. The Forest Service also improved automotive and truck specifications in order to obtain vehicles better suited and more economical for field programs.

Improved Equipment

Forest Service equipment development centers at Arcadia, Calif., and Missoula, Mont., continued to devise new types of equipment or improve existing equipment for more efficient operations.

In aid of fire prevention and suppression was the development and testing of small spark arresters, a lightweight slip-on tank constructed of fiberglass or galvanized steel, and a lightweight 50-man fire camp that is packaged for transport by helicopter. New flame-resistant clothing being tested shows great promise of reducing loss of life or injuries to firefighters.

Seeking to combat the loss of salmon spawning grounds from siltation, the Forest Service studied various methods of silt removal. The result, after all concepts were evaluated, was a flushing machine, which was designed and built as scale model. The feasibility of this type of operation was demonstrated in Alaskan streams during the summer.

Tests were made of a mobile incinerator for trash in public campgrounds, and a brush cutter that could have many applications in reforestation, slash cleanup, tree thinning, and fire protection. The incinerator should effect substantial savings as compared with conventional methods of trash removal, particularly where long hauls are necessary. Limited trials of the brush cutter also showed promising results.

Buildings and Facilities

Newly constructed administrative buildings included 133 dwellings, 62 barracks, etc., and 347 miscellaneous buildings such as offices, messhalls, warehouses, and garages. Twenty-one major buildings (over $50,000 each) were completed, and construction was begun on 13 major buildings with an estimated total cost of $2,176,000. Planning and design was started for 15 major new buildings.

Job Corps Construction

Preparations for the establishment of the Job Corps included considerable engineering services. Coordinated specification standards, site plans, and cost estimates had to be developed in cooperation with the Office of Economic Opportunity for Job Corps Conservation Centers on the National Forests and on other public lands. In the latter part of the year, actual construction was underway on the first nine centers to be established on the National Forests.

Surveys and Maps

For effective management of the National Forests and National Grasslands, the Forest Service needs accurate maps covering 607,070 square miles. Although the coverage is not complete, map production is steadily increasing. In fiscal year 1964 planimetric maps were produced for 44,089 square miles, and topographic maps for 1,439 square miles, bringing total coverage to 52 percent and 38 percent, respectively, of the needed area.

Topographic map production increased 19 percent over the preceding year. In addition, over 1,600 specialized maps were prepared by field offices for timber sales, site plans, and other local needs, and 124 road projects were studied or de-

signed by modern aerial photogrammetric techniques.

Aerial photography continues to be an important tool in resource management. Nearly 42,000 square miles of large-scale photography (1: 15,840) was obtained this year at a cost of $240,000.

Property Lines and Corners

The Forest Service since 1958 has carried on a continuing program to locate and permanently mark 281,168 miles of property lines and 1,132,353 corners. This work, done in cooperation with adjacent landowners, is essential to effective National Forest management where Federal, State, and private holdings are intermixed. Complicating the work, little had been done previously to protect markings and other evidence from deterioration; consequently, many corners cannot be located and must be resurveyed before they can be marked.

During the fiscal year, field search was made for 23,363 corners; 11,322 corners were remonumented with permanent markers, while 10,530 corners could not be found and would need expensive cadastral surveys to fix their positions. A total of 1,036 miles of property lines were located and marked to full standard, and 1,993 miles were marked temporarily.

LANDS

A continuing program of land adjustments and classification is carried on. It includes adjustments of boundaries, modification of landownership patterns through land purchases and exchanges, designation of purchase areas, and related activities. The need is exemplified in the fact that within eastern National Forest boundaries, only about one-half of the land is administered by the Forest Service, frequently in widely scattered tracts. On nearly all National Forests intermingled ownerships complicate land management and limit access.

New Law Will Aid Program

The program, which progresses as rapidly as funds and personnel allow, will be helped greatly in the future by the recent Land and Water Conservation Fund Act. The act provides a means by which money will accumulate in a fund from which appropriations can be made for Federal land purchases for specified purposes. Its provisions are described on page 35 of this report.

At the close of fiscal year 1964, the Forest Service administered a total of 186.3 million acres in 44 States, Puerto Rico, and the Virgin Islands. These lands are in 154 National Forests, 19 National Grasslands, 14 National Forest purchase units, 21 experimental areas outside National Forests, and 24 land utilization projects.

Major Actions

In 1964 modifications of boundaries excluded 8,800 acres from the Los Padres National Forest in California, and 1,535 acres from the Toiyabe National Forest in Nevada; these areas had been determined to be urban or agricultural in character. The boundary of the Toiyabe National Forest was extended to include some 21,300 acres of high watershed land. In other areas more than 8,000 acres in isolated small tracts of public domain land were added to the National Forests to which they logically belong.

Following a joint Forest Service-Bureau of Land Management study of lands in Montana, proposals are being processed for the transfer of some 28,000 acres of National Forest land to the Bureau of Land Management for administration, and a similar transfer of 36,000 acres of public domain in western Montana to National Forest status. This transfer involves small National Forest units located some distance from the other areas with which they are managed and public domain lands adjacent to large National Forest areas. National Forest and public domain land administration will be improved by these transfers.

In Idaho a joint study is underway with the National Park Service to ascertain the extent of various resource potentials for a half-million acres in the Sawtooth Mountain area and the type of administration that would be in the best public interest. The study, in which the Bureau of Outdoor Recreation is also participating, was initiated following legislative proposals to create a Wilderness National Park from portions of three National Forests.

The Forest Service is studying the feasibility and need for National Forest programs in the eastern Kentucky highlands. The Governor recommended in 1963 that National Forest units be established at the headwaters of major streams, from which disastrous floods had originated. The potentials for watershed rehabilitation, sustained yield timber growth, and the development of outdoor recreation and wildlife resources are being considered, together with the effect that resource restoration programs would have on the depressed local economies.

The Departments of the Army and Agriculture have approved a comprehensive agreement concerning management and jurisdiction of land at Corps of Engineers water projects constructed within or near National Forests. The agreement provides the basis for resolving jurisdictional problems at more than 20 existing or authorized reservoir projects, and provides for advance agreements when new reservoirs are developed. Accordingly, transfers of land at the Allegheny Reservoir in Pennsylvania were agreed upon in 1964 to assure unified administration of important related recreation resources.

The National Forest Reservation Commission

and the State of Pennsylvania approved the extension of the Allegheny National Forest to include the west side of the Allegheny Reservoir. The Commission also approved establishment of a 12,200-acre National Forest purchase unit in Arkansas, adjoining the Ozark National Forest; this authorizes acquisition of forest and watershed lands for multiple resource use and to protect tributaries of a potential large reservoir.

Purchases and Exchanges

Under various land adjustment authorities, 512 properties totaling 47,754 acres net were approved for purchase or exchange for National Forest purposes during fiscal year 1964. Two hundred and fifty-three of these properties, containing 28,022 acres, were purchased within the National Forests east of the Great Plains under the Weeks law. Ninety purchases involving 12,851 acres affect the Boundary Waters Canoe Area of the Superior National Forest, Minn.; the Cache, Uinta, and Wasatch National Forests in Utah; and the Angeles, Cleveland, and San Bernardino National Forests in California. Forty-nine small tracts totaling 172 acres will be used for Forest Service administrative and research activities.

One hundred and twenty of the land adjustments were made through exchanges in which the United States will receive 129,612 acres of land within National Forests or National Grasslands and will grant in exchange 122,903 acres and 3,978,000 board feet of timber.

Changes in fiscal year 1964 in land administered by the Forest Service are as follows.

	Acres
Total area administered by Forest Service (owned by United States), June 30, 1963	186,203,183
Increases:	
Purchased	28,888
Conveyed to United States in exchange	150,320
Donated to United States	915
Transferred from other Federal agencies	1,844
Reserved from public domain	12,201
Found by status check to be United States land	24,300
Recomputations, adjustments, and miscellaneous	2,333
Total	220,801
Reductions:	
Conveyed by United States in exchange	98,832
Grants, sales, reconveyances, mining patents, homesteads, etc	6,718
Transferred to other Federal agencies	20
Eliminated from National Forests and returned to public domain status	11
Found by status check to be private land	13,941
Recomputations, adjustments, and miscellaneous	1,823
Total	121,345
Increases minus decreases	99,456
Total area administered by Forest Service (owned by United States), June 30, 1964	186,302,639

Land Status

The Service-wide review and compilation of accurate land status records was accelerated in 1964. The project was begun in 1961 to provide up-to-date, reliable records for use by field personnel in their complex land management work. Thus far, work has been completed on land records for 2,600 townships (1,500 during 1964) out of the equivalent of 17,153 administered by the Forest Service. Work has been completed for 10 National Forests and 19 additional ranger districts; work is underway for 24 National Forests and 36 additional ranger districts.

Rights-of-Way

Since the issuance of revised National Forest access regulations in June 1963, there has been good progress in improving access to publicly owned areas for more intensive resource management and protection. During the fiscal year 20 cooperative cost-sharing road construction and use agreements were made with private landowners, involving 382 miles of existing roads valued at $2.6 million. These roads provide access for multiple-use management of resources in the areas, including 4.7 billion board feet of timber.

Purchase of rights-of-way also increased considerably. A total of 1,226 rights-of-way over 1,037 miles of proposed or existing roads were acquired—2½ times the number of cases handled in fiscal year 1961. Under the new access regulations there has been an increase in the use of condemnation proceedings where needed rights-of-way could not be obtained through negotiations. In contrast with only 2 condemnations in 1961 and only 14 in 1951–60, there were 44 cases in fiscal year 1964, of which 20 were for rights-of-way across State lands where the State lacked authority to grant access.

Negotiations were completed for acquiring interests in 14 private roads totaling 100 miles at a cost of $350,000, which was made available by a special access fund of $6 million established by Congress in fiscal year 1961. Negotiations are also well along on nine additional roads with another 100 miles that will cost $513,000; when these have been consummated, the special fund will have been expended for the purpose intended.

A series of joint meetings between personnel of the Forest Service and the Bureau of Public Roads resolved problems in the granting of rights-of-way to States for public highways across National Forest lands under the Highway Act of August 27, 1958. The agreement provided that easements for construction and use are to be granted by the Department of Commerce after the Forest Service has approved State applications to the Regional Foresters. This now clears the way for a large backlog of highway easements resulting from the accelerated Federal aid highway program.

Essential Support Functions

Underlying all of the programs described in the preceding pages, there is a solid foundation of essential operations that keep the Forest Service operating smoothly. Personnel recruitment, training, and assignment are managed for the maximum benefit of both the individual and the Service. Fiscal operations are administered so that the public gets the most out of every dollar spent. Improved management systems are developed and put into practice, and day-to-day administrative services are handled economically and efficiently. Publications, procurement, communications, and many other matters cannot be neglected in the least if the Service is to succeed in its basic tasks in National Forest management and protection, forestry research, and cooperation in State and private forestry programs.

JOB CORPS ADMINISTRATION

The signing of the Economic Opportunity Act by President Johnson on August 20, 1964, made the Job Corps an integral part of the overall war on poverty, and placed upon the Forest Service a major responsibility for organizing and operating many of the Conservation Centers. The Division of Job Corps Administration was created within the Washington Office of the Forest Service to direct and coordinate the program on National Forests.

Fifty-six Centers

Intense planning was carried on throughout 1964 in preparation for this program. Fifty-six sites in 34 States were selected for the construction of Job Corps Conservation Centers by the end of fiscal year 1965. Forty-three of these centers will be activated in the last half of the fiscal year, with a total enrollment of 5,800 corpsmen. The remaining 13 centers will be activated in early fiscal year 1966. Plans also were made to construct additional centers in fiscal year 1966.

Building Men

Integrated work programs and educational programs were designed to prepare the corpsmen for the responsibility of citizenship and to increase their employability by providing them education, vocational training, and useful work experience including work directed toward the conservation of the natural resources. The ultimate goal is to build rugged men of strong character. Nature's healthful environment will be a strong influence in building better men, at once conducive to improving their physical health and mental outlook.

Building Resources

Work programs scheduled for the corpsmen will provide for the development of recreation facilities, timber stand improvements, erosion control projects, range improvements, wildlife habitat improvements, road and trail construction and rehabilitation, and fire control projects. At the same time, the young men will receive on-the-job training in skills that will prepare them for employment.

The educational program is designed to teach remedial reading, writing, and arithmetic and additional vocational training. It will use the latest techniques including teaching machines, audiovisual presentations, and on-the-job tutoring.

ADMINISTRATIVE MANAGEMENT

The Forest Service continually seeks new ways to increase efficiency of its operations so as to get the greatest return for the public's investment in National Forests, forestry research, and cooperative programs. During 1964, 16 Service-wide management studies and projects were completed and their results implemented.

One of the most significant activities was the productivity increase program, designed to implement Government-wide efforts to gain greater efficiency and economy in Federal operations. Under this program, management improvement targets have been brought together in one overall goal of cost savings.

Workload and Utilization Studies

A service-wide study was made to identify critical factors related to engineering functions. This included recruiting, training, and developing engineers; performance and job satisfaction; and the correlation of engineering work to overall program objectives. The study is part of a continuing effort to use more effectively the human resources in various areas of management, and to develop organization principles, patterns, and methods for more efficient accomplishment of Forest Service programs. As part of the study, the total National Forest engineering workload—professional and nonprofessional—was measured and integrated into the Supervisor's and Ranger's workload base.

Workloads were measured in several key areas of National Forest management, each of which relates strongly to other key areas of work. The Rangers' and Supervisors' recurrent workload was redescribed, reorganized, and remeasured. The new workload description includes all material needed by field units for local remeasurement of their base workloads during periods between Service-wide measurements. Besides the engineering workload, the insect and disease control base workload was measured and integrated into the Rangers' and Supervisors' base organization financing. The formulas and form for measuring the National Forest business management jobload were revised to reflect the greater delegation of contracting and collection work.

Other Studies

A pilot study of timber sale costs was completed in the Pacific Northwest Region. Its findings were used in collecting comparable timber sale cost data from the nine other Regions.

A review of recurring reports was made in 1964. As a result, the Forest Service improved and reduced its internal reports with estimated savings of $89,211 annually.

PROGRAMS AND LEGISLATION

Legislation

Four laws having major impacts on Forest Service activities were enacted during the second session of the 88th Congress: The Wilderness Act (Public Law 88–577), the Land and Water Conservation Fund Act of 1965 (Public Law 88–578), an act providing for the enforcement of rules and regulations for the protection, development, and administration of the National Forests and National Grasslands (Public Law 88–537), and an act enabling the Secretary of Agriculture to construct and maintain an adequate system of roads and trails for the National Forests (Public Law 88–657).

The Wilderness Act declares a congressional policy that wilderness is an essential part of the American heritage, and to implement that policy it creates a national wilderness preservation system (p. 26).

The Land and Water Conservation Fund Act establishes a fund to be used for planning, acquisition, and development of State recreation lands and waters and for Federal acquisition of areas valuable for recreation purposes. The fund will derive revenues from three sources: (1) Net proceeds from the disposal of surplus Federal real property; (2) certain proceeds from motorboat fuel taxes; and (3) proceeds from recreation user fees which are authorized to be charged at certain Federal recreation areas.

Public Law 88–537 authorizes U.S. Commissioners to try violators of National Forest and National Grassland rules and regulations. By providing a simple, localized, and practical means of bringing "petty violators" to hearing and settlement, the act facilitates the protection of the vast numbers of careful and law-abiding visitors and users of the National Forest System.

Public Law 88–657 includes authority for the Secretary of Agriculture to grant and terminate road easements over lands administered by the Forest Service, to provide for "maximum economy" forest development roads, and to provide for the proper maintenance of these roads. This authority will facilitate the installation and maintenance of an adequate system of roads and trails to serve the National Forests.

Other laws enacted in the 2d session of the 88th Congress which affect the Forest Service include: The Civil Rights Act (Public Law 88–352); establishment of water resources research centers (Public Law 88–379); The Economic Opportunity Act of 1964 (Public Law 88–452); establishment of Ozark National Scenic Riverways (Public Law 88–492); relinquishing to Wyoming certain jurisdiction over the Pole Mountain District, Medicine Bow National Forest (Public Law 88–494); establishment of the Public Land Law Review Commission (Public Law 88–606); and establishment of a Lewis and Clark Trail Commission (Public Law 88–630).

During the same session the Forest Service followed on a day-to-day basis some 800 bills which would affect its activities. It prepared legislative reports on 62 bills and legislative proposals; assisted in the preparation and presentation of 18 statements before congressional committees; and reviewed and commented on 26 reports prepared by other Federal agencies. Legislative drafting services were provided as requested on four proposed bills.

Program Planning

A variety of special studies were conducted in support of Forest Service programs and in close coordination with other Departments, agencies, and divisions. These studies and planning activities are influenced by the rising demands expected early in the next century or sooner.

One major study analyzed resources and needs on the commercial forest land in State and private ownership. This land base constitutes four-fifths of the Nation's commercial forests, and thus will play a critical role in meeting future resource needs. Tentative 10-year program proposals incorporating more than a dozen different forestry activities were developed for multiple use of the resources on these lands. Management would be intensified on a moderately rising scale over the remainder of the century.

A major report was completed on outdoor recreation in the National Forests to give an overall view of recreation opportunity on these public lands. It will provide basic information for public use of a large share of the Nation's outdoor

recreation resources. It reviews resource management policies and programs and describes activities and resources.

An interdivision task force considered new approaches to streamline and update the flow of management information within the Forest Service. It made plans for a 3-year study of Forest Service information handling systems with the ultimate aim of developing a pilot integrated total information handling system for the Forest Service, to be followed by a full-scale system.

Other supporting activities included work on legislative reference material for an Appalachian program in forestry, development of general guides for the analysis of management methods and planning objectives in the eastern National Forests, preliminary work on a revised departmental Conservation Needs Inventory, and collaboration in interdepartmental task groups for development of new programs and policies.

CIVIL DEFENSE

The Forest Service bears a continuing responsibility as a part of the Nation's civil defense effort, with specific duties assigned to it by the Secretary under Executive Order 10998. This effort is directed toward achieving a high degree of preparedness against nuclear attack or any other widespread emergency.

The primary civil defense responsibility of the Forest Service is to develop an effective national rural fire defense against the widespread fires that might follow nuclear explosions. This defense is needed particularly on the 500 million acres of pasture, crop, and intermingled woodlands which have little or no organized protection except that furnished by local fire units. A national committee and 48 State rural fire defense committees have been organized to coordinate local, State, and Federal planning.

Training Rural Fire Crews

A pilot program of rural Civil Defense fire suppression training was launched in Colorado, Florida, Kentucky, Missouri, and Oregon. With funds furnished by the Office of Civil Defense, the Forest Service worked through the State Foresters to carry out selected projects for the organization, training, and equipping of volunteer rural fire suppression groups. The program is coordinated with the efforts of Federal, State, and local agencies and private organizations. Thus far it has been well received and will be expanded as funds become available.

A Fire Defense Plan

The Office of Civil Defense, Department of the Army, has asked the Forest Service to make an organization study to develop a comprehensive defense plan for the total rural and urban fire problem that might be expected from nuclear attack. Segments of this study have been assigned to other public and private agencies under contractual arrangements. The end product will be a plan for reducing potential fire impacts.

Civil Defense Research

A system and procedure was developed for obtaining information on rural fires and fire damage through USDA county and State Defense Boards.

Three research projects related to defense activities were carried on in cooperation with the Office of Civil Defense. These were: (1) an analysis of weather patterns within the United States and their effect on potential mass fire development; (2) a study of mass fire initiation to determine conditions inside and adjacent to large fires, from which a basis can be developed for insuring the safety of military and civilian populations; and (3) a study to develop infrared aerial scanning equipment and techniques for improved aerial reconnaissance of fires.

Monitors Trained

Radiological monitoring capability was improved with the training of additional monitors. Trained personnel now number about 2,600 employees, assigned to 874 fully equipped monitoring stations.

A fallout sheltering policy to provide protection in existing and proposed Forest Service structures was completed and issued for service-wide use. Implementation depends on availability of funds.

Defense preparedness for employee and family survival was continued throughout the year. Approximately 1,600 employees participated in formal training in survival preparedness, medical self-help, civil defense, and shelter management. Forest Service personnel served as members of Regional, State, and county USDA Defense Boards. Cadre emloyees to man the National and Department's Relocation Sites in a declared national emergency were designated.

PERSONNEL MANAGEMENT

During 1964 personnel records on every employee were entered into the automatic data-processing system operated by the Department of Agriculture. The system is now being used to process payrolls and to produce employment data needed for recurring reports. Within the next year the system is expected to produce data needed for manpower planning at each echelon of organization. The data now in the system provide the initial step in the plan for developing a personnel skills inventory from which rosters of employees in need of specialized training or eligible for specified positions can be produced.

Personnel specialists from each Forest Service Region jointly reviewed long-range goals and current programs to develop solutions to problems that arise with increasing the productivity of employees at all levels. Considerable attention was

given to improved managerial techniques and to better means of predicting employee success.

Effective prevention of injuries and accidents reduced costs more than half a million dollars below the average for the previous 5 years. Greater employee productivity was reflected in the increased volumes of work accomplished with fewer employees than in previous fiscal years. Authority to appoint personnel was delegated to 25 additional National Forests during the year.

BUDGET AND FINANCE

Receipts and Expenditures

Receipts from the sale or use of National Forest resources amounted to $135,721,658 in fiscal year 1964. These receipts came from the following major sources:

Timber	$127,959,538
Grazing	3,181,930
Other	4,580,190
Total	135,721,658

The figures includes $4,154,700 received from National Forest revested Oregon and California Railroad grant lands. Resource revenue amounting to $1,792,840 was received from National Grasslands and land utilization areas administered under title III of the Farm Tenant Act.

Other amounts received, not listed above, included $884,544 contributed by cooperators and timber purchasers for cooperative work on National Forest programs, $19,911,092 set aside for timber sale area improvements, $9,530,977 set aside for brush disposal, $1,309,431 from miscellaneous receipts, and $19,735 for restoration of forest lands and improvements.

Direct receipts and deposits from all sources totaled $169,170,277. In addition, timber purchasers built roads valued at $50,972,870 incident to timber harvest. Other Federal agencies collected $15,998,600 for power licenses, mineral leases, and permits on National Forest land of public domain origin.

Operating expenses for National Forest programs, National Grasslands, and land utilization projects amounted to $175,374,240. Depreciation of roads, trails, and other improvements was estimated at $47,074,417.

Receipts and all other credits exceeded operating expenditures and other charges by $13,720,344.

Expenditures for other Forest Service activities included $22,727,739 for cooperative State and private forestry programs, and $26,174,911 for forestry research. Cooperator contributions to these programs were $2,525,352 for cooperative forestry programs and $915,723 for research. The Forest Service also received $53,586 in royalties from the Smokey Bear forest fire prevention program.

Under the act of May 23, 1908, as amended, the Forest Service pays 25 percent of National Forest net receipts to States for support of schools and roads in counties containing National Forest lands. This payment in fiscal year 1964, based on fiscal year 1963 receipts, was $29,993,959. Arizona and New Mexico school funds also received $100,413 under provisions of the act of June 20, 1910. Under the act of June 22, 1948, Minnesota received $130,986. Counties containing National Grasslands and land utilization areas received $455,379 for schools and roads from calendar year 1963 receipts under the act of July 22, 1937.

By law the Forest Service retains 10 percent of receipts from National Forest resources for development of National Forest roads and trails, except on revested Oregon and California Railroad grant lands. The amount retained in this fund in fiscal year 1964 was $13,141,263.

Statistical Tables

NOTE: Other statistical tables will be published later in a statistical supplement.

TABLE 1.—*National Forest and other lands administered by the Forest Service, as of June 30, 1964*

State, Commonwealth, or possession	National Forest [1]	National Grassland	Land utilization projects	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	631,542	0	0	631,542
Alaska	20,741,964	0	0	20,741,964
Arizona	11,410,808	0	0	11,410,808
Arkansas	2,423,425	0	0	2,423,425
California	19,951,407	0	19,115	19,970,522
Colorado	13,718,164	611,970	560	14,330,694
Florida	1,075,089	0	0	1,075,089
Georgia	777,444	0	9,340	786,784
Idaho	20,298,262	47,599	0	20,345,861
Illinois	211,554	0	0	211,554
Indiana	122,710	0	3,180	125,890
Iowa	0	0	360	360
Kansas	0	107,114	0	107,114
Kentucky	460,693	0	0	460,693
Louisiana	591,637	0	0	591,637
Maine	49,558	0	465	50,023
Massachusetts	1,651	0	0	1,651
Michigan	2,573,139	0	6,695	2,579,834
Minnesota	2,770,352	0	0	2,770,352
Mississippi	1,134,006	0	0	1,134,006
Missouri	1,359,143	0	12,938	1,372,081
Montana	16,637,813	0	0	16,637,813
Nebraska	245,409	94,307	0	339,716
Nevada	5,058,500	0	0	5,058,500
New Hampshire	678,104	0	0	678,104
New Mexico	8,863,175	133,904	89,426	9,086,505
New York	0	0	13,747	13,747
North Carolina	1,125,196	0	0	1,125,196
North Dakota	520	1,104,330	0	1,104,850
Ohio	110,852	0	0	110,852
Oklahoma	224,796	46,607	0	271,403
Oregon	15,362,096	102,920	0	15,465,016
Pennsylvania	471,620	0	0	471,620
South Carolina	587,164	0	0	587,164
South Dakota	1,121,137	864,268	2,885	1,988,290
Tennessee	597,625	0	1,212	598,837
Texas	658,027	117,269	0	775,296
Utah	7,946,494	0	0	7,946,494
Vermont	232,469	0	0	232,469
Virginia	1,453,853	0	0	1,453,853
Washington	9,687,801	0	520	9,688,321
West Virginia	905,647	0	0	905,647
Wisconsin	1,468,085	0	1,130	1,469,215
Wyoming	8,570,617	573,167	0	9,143,784
Puerto Rico	27,889	0	27	27,916
Virgin Islands	147	0	0	147
Total	182,337,584	3,803,455	161,600	186,302,639

[1] This column includes all lands administered by the Forest Service, except National Grasslands and land utilization project lands which are shown separately.

TABLE 2.—*Volume and value of timber cut from National Forests, timber stand improvements, and area planted and seeded to trees, fiscal year 1964*

State and Commonwealth	Timber cut		Timber stand improvement,[1] fiscal year 1964	Area planted and seeded to trees	
	Volume	Value		Fiscal year 1964	Total planted and seeded through June 30, 1964
	Thousand board feet	*Dollars*	*Acres*	*Acres*	*Acres*
Alabama	55, 632	$1, 180, 063	13, 703	5, 935	80, 243
Alaska	417, 399	920, 583	116	105	4, 767
Arizona	296, 985	1, 741, 424	18, 650	756	6, 213
Arkansas	164, 506	3, 841, 053	57, 614	6, 745	60, 248
California	1, 862, 713	22, 782, 375	21, 722	20, 931	181, 212
Colorado	178, 017	700, 088	7, 877	6, 547	87, 989
Florida	95, 693	1, 521, 173	1, 979	4, 881	62, 060
Georgia	44, 192	1, 059, 144	17, 271	3, 202	49, 542
Idaho	811, 424	5, 977, 419	7, 847	14, 390	158, 393
Illinois	6, 052	58, 275	1, 544	1, 919	48, 982
Indiana	6, 119	58, 162	2, 788	1, 231	26, 802
Iowa	10	53	0	0	60
Kentucky	25, 252	370, 808	8, 507	398	2, 669
Louisiana	65, 980	1, 183, 399	21, 432	5, 718	159, 127
Maine	1, 220	13, 695	985	0	67
Michigan	143, 702	966, 207	18, 878	13, 247	631, 813
Minnesota	137, 218	699, 882	6, 957	8, 826	186, 528
Mississippi	119, 547	2, 165, 525	49, 715	7, 619	227, 669
Missouri	37, 206	358, 897	30, 627	6, 485	94, 517
Montana	710, 356	5, 426, 466	12, 235	8, 234	72, 543
Nebraska	36	140	330	407	31, 245
Nevada	230	741	0	0	506
New Hampshire	28, 693	327, 569	14, 723	9	1, 181
New Mexico	104, 783	503, 721	6, 498	1, 624	6, 103
New York	49	305	68	0	42
North Carolina	46, 784	777, 687	8, 497	4, 208	33, 737
North Dakota	42	410	0	0	0
Ohio	4, 624	42, 402	4, 028	740	20, 823
Oklahoma	8, 093	182, 310	8, 851	2, 305	10, 513
Oregon	3, 313, 969	65, 856, 461	31, 272	45, 466	400, 575
Pennsylvania	30, 223	1, 054, 062	13, 189	280	19, 630
Puerto Rico	1	25	0	0	0
South Carolina	96, 977	2, 150, 802	9, 191	2, 944	28, 220
South Dakota	33, 182	197, 103	4, 907	579	42, 926
Tennessee	33, 191	424, 477	9, 626	947	10, 976
Texas	105, 724	1, 940, 600	9, 542	1, 989	58, 131
Utah	55, 346	308, 091	4, 184	1, 668	7, 665
Vermont	12, 728	311, 128	7, 035	0	1, 430
Virginia	38, 896	242, 495	12, 145	1, 270	7, 937
Washington	1, 654, 676	24, 332, 220	9, 611	18, 877	256, 831
West Virginia	32, 687	493, 925	14, 092	677	19, 043
Wisconsin	77, 618	562, 871	7, 381	4, 994	247, 579
Wyoming	96, 418	340, 713	4, 212	1, 709	11, 389
Total	10, 954, 193	151, 074, 949	479, 829	207, 862	3, 357, 926

[1] Includes release, weeding, thinning, and pruning only.

TABLE 3.—*Estimated legal harvest of big-game animals* [1] *on National Forests and National Grasslands, fiscal year 1964*

State	Deer	Elk	Bear	Bighorn	Total big game [2]
	Number	*Number*	*Number*	*Number*	*Number*
Alabama	1,400				1,400
Alaska	12,000	80	600	30	14,000
Arizona	18,000	1,000	110	2	21,000
Arkansas	3,600				3,600
California	28,000		600		29,000
Colorado	81,000	11,000	560	90	93,000
Florida	1,400		25		1,400
Georgia	3,000				3,000
Idaho	45,000	12,000	1,700	100	60,000
Illinois	3,000				3,000
Indiana	370				370
Kentucky	250				250
Louisiana	1,400				1,400
Maine	95		5		100
Michigan	22,000		250		22,000
Minnesota	16,000		410		16,000
Mississippi	2,600				2,600
Missouri	4,200				4,200
Montana	53,000	9,200	1,200	130	66,000
Nebraska	335				625
Nevada	14,000	10	2	3	14,000
New Hampshire	610		40		650
New Mexico	15,000	780	140		16,000
North Carolina	4,100		170		4,400
North Dakota	3,200				4,600
Ohio	110				110
Oklahoma	120				120
Oregon	55,000	15,000	1,300		71,000
Pennsylvania	4,700		30		4,700
South Carolina	770				770
South Dakota	9,400				12,000
Tennessee	1,100		40		1,200
Texas	990				1,000
Utah	88,000	1,100	40		89,000
Vermont	500		50		550
Virginia	8,900		250		9,200
Washington	28,000	5,600	1,400		35,000
West Virginia	1,400		45		1,400
Wisconsin	4,500		150		4,700
Wyoming	36,000	9,400	320	75	50,000

[1] Figures rounded in posting and totals.
[2] Also includes antelope, moose, mountain goat, peccary, and wild boar.

TABLE 4.—*Construction, reconstruction, and maintenance of National Forest (forest development) roads, bridges, and trails, fiscal year 1964*

State and Commonwealth	Roads		Bridges: construction, reconstruction, and replacement	Trails		Total obligations from all funds including APW [1]
	Construction and reconstruction	Existing		Construction and reconstruction	Existing	
	Miles	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	24. 9	1, 545. 3	7	0. 0	0. 0	601, 090
Alaska	30. 5	270. 9	2	3. 0	501. 5	2, 445, 812
Arizona	65. 2	10, 370. 8	2	19. 0	3, 745. 7	2, 798, 950
Arkansas	37. 6	4, 459. 2	4	0	0	1, 111, 748
California	87. 0	30, 524. 7	9	63. 8	14, 987. 4	15, 024, 123
Colorado	194. 0	13, 841. 3	9	74. 2	9, 400. 6	4, 388, 831
Florida	26. 5	1, 416. 5	11	0	0	474, 595
Georgia	45. 0	2, 747. 1	1	0	182. 6	647, 444
Idaho	200. 5	17, 003. 5	25	80. 3	19, 693. 3	7, 180, 758
Illinois	5. 4	954. 4	2	6. 0	31. 3	323, 025
Indiana	8. 9	552. 7	0	0	0	213, 894
Kentucky	12. 4	1, 449. 3	1	30. 2	125. 5	556, 003
Louisiana	18. 5	1, 361. 4	17	0	0	391, 708
Maine	1. 6	54. 6	0	0	85. 4	26, 604
Michigan	104. 8	6, 058. 7	0	0	43. 4	1, 855, 172
Minnesota	47. 8	3, 097. 9	2	0	472. 7	1, 881, 520
Mississippi	11. 0	2, 521. 0	13	5. 0	5. 0	731, 562
Missouri	66. 4	2, 483. 7	0	0	0	774, 502
Montana	189. 8	13, 144. 6	37	73. 8	15, 349. 3	6, 596, 071
Nebraska	18. 7	367. 2	0	0	1. 0	143, 469
Nevada	32. 7	3, 088. 5	2	13. 0	1, 873. 6	480, 963
New Hampshire	8. 6	414. 3	1	1. 5	1, 000. 6	489, 349
New Mexico	65. 9	8, 225. 7	1	64. 8	3, 962. 2	2, 237, 166
North Carolina	15. 4	2, 852. 8	0	3. 3	1, 207. 6	847, 656
North Dakota	0	. 3	0	0	0	0
Ohio	1. 1	273. 7	0	0	0	141, 558
Oklahoma	10. 5	483. 5	0	0	0	153, 396
Oregon	188. 3	25, 740. 3	45	77. 7	8, 985. 3	14, 002, 085
Pennsylvania	6. 5	829. 8	0	0	167. 4	602, 980
Puerto Rico	0	23. 1	0	6. 0	39. 4	26, 271
South Carolina	23. 6	1, 854. 4	0	2. 8	2. 8	374, 105
South Dakota	6. 6	1, 773. 5	2	0	10. 3	482, 080
Tennessee	32. 2	1, 151. 1	1	0	500. 8	831, 827
Texas	20. 2	1, 639. 2	10	0	0	481, 148
Utah	144. 5	6, 169. 4	11	22. 9	6, 517. 8	2, 655, 928
Vermont	1. 5	469. 5	0	0	185. 5	232, 698
Virginia	38. 8	3, 513. 0	0	0	867. 6	802, 172
Washington	144. 1	10, 169. 2	31	64. 8	8, 236. 5	8, 711, 239
West Virginia	38. 1	2, 136. 8	0	0	752. 7	1, 185, 310
Wisconsin	78. 8	2, 886. 5	0	0	0	1, 051, 645
Wyoming	81. 8	5, 943. 5	6	40. 6	5, 721. 5	2, 729, 935
District of Columbia [2]	0	0	0	0	0	1, 119, 400
Total	2, 135. 7	193, 862. 9	252	652. 7	104, 656. 3	87, 805, 792

[1] Total obligations for construction, reconstruction, and maintenance. APW = Accelerated Public Works.
[2] Administrative expenses.

TABLE 5.—*Recreation sites and capacities on the National Forests and National Grasslands as of June 30, 1964*

Type of facility	Sites classed according to number of annual visits						Area	Normal capacity (persons at one time)	Number of family units			
	Under 1,000	1,000 to 5,000	5,000 to 15,000	15,000 to 25,000	Over 25,000	Total			Tent camping	Trailer camping	Picnicking	Total
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Number*	*Number*	*Number*	*Number*	*Number*
Campground	2,535	1,469	661	148	95	4,908	29,254	294,445	44,190	6,656	6,423	57,269
Picnic site	399	542	321	101	117	1,480	7,110	95,191	955	87	17,075	18,117
Subtotal	2,934	2,011	982	249	212	6,388	36,364	389,636	45,145	6,743	23,498	75,386
Organization camp owned by Forest Service	32	37	6	0	0	75	935	8,664				
Organization camp in private ownership	227	225	44	2	0	498	6,513	64,817				
Hotel, lodge, or resort owned by Forest Service	4	3	4	2	4	17	220	2,058				
Hotel, lodge, or resort in private ownership	117	144	85	19	30	395	2,629	49,668				
Other public service	75	53	37	10	24	199	890	16,993				
Recreation residence	1,868	268	66	9	4	2,215	18,971	105,978	-------	------	-------	[1] 19,342
Swimming site	34	76	74	29	26	239	594	39,569				
Boating site	188	211	96	13	8	516	919	39,434				
Winter sports site	37	41	42	17	59	196	42,469	241,974				
Observation site	87	71	55	19	60	292	643	15,446				
Total	5,603	3,140	1,491	369	427	11,030	111,147	974,237	45,145	6,743	23,498	75,386

[1] Number of residences.

TABLE 6.—*Distribution of forest and windbarrier planting stock by cooperating States, fiscal year 1964 (under Clarke-McNary Program)*

State and Commonwealth	Expenditures derived from—				Trees distributed
	Federal allotment	State appropriation	Receipts	All sources	
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Number*
Alabama	3,000	41,836	142,311	187,147	35,845,000
Arkansas	7,000	75,544	32,941	115,485	7,138,000
California	4,425	108,967	27,867	141,259	2,304,000
Colorado	11,700	16,228	34,771	62,699	485,000
Connecticut	4,000	15,421	24,085	43,506	1,375,000
Delaware	3,000	12,821	0	15,821	812,000
Florida	3,000	27,742	268,267	299,009	61,064,000
Georgia	3,000	130,091	160,043	293,134	36,790,000
Hawaii	4,425	103,145	0	107,570	1,735,000
Idaho	13,500	15,476	13,000	41,976	541,000
Illinois	5,000	55,447	54,557	115,004	4,517,000
Indiana	4,000	124,637	73,972	202,609	4,656,000
Iowa	0	0	36,278	36,278	1,359,000
Kansas	12,000	12,300	38,300	62,600	1,446,000
Kentucky	3,000	134,632	126,145	263,777	13,349,000
Louisiana	3,000	93,941	133,029	229,970	31,156,000
Maine	4,000	32,641	46,808	83,449	2,960,000
Maryland	3,000	37,760	8,769	49,529	5,093,000
Massachusetts	3,000	34,995	10,845	48,840	333,000
Michigan	3,000	73,339	62,453	138,792	11,625,000
Minnesota	3,000	289,915	132,917	425,832	27,508,000
Mississippi	3,000	93,123	234,753	330,876	52,800,000
Missouri	4,000	91,446	58,945	154,391	6,298,000
Montana	13,500	25,565	35,714	74,780	1,054,000
Nebraska	0	0	105,500	105,500	2,310,000
Nevada	8,000	10,868	5,982	24,850	90,000
New Hampshire	3,000	22,846	12,013	37,859	1,256,000
New Jersey	4,000	14,064	8,263	26,327	628,000
New Mexico	6,000	6,175	3,911	16,086	114,000
New York	3,000	298,669	103,970	405,639	16,055,000
North Carolina	0	262,695	247,999	510,694	32,475,000
North Dakota	12,000	25,154	40,580	77,734	889,000
Ohio	6,778	131,578	113,480	251,836	11,782,000
Oklahoma	12,000	26,403	5,664	44,067	1,131,000
Oregon	5,925	19,379	96,693	121,997	10,665,000
Pennsylvania	3,000	161,285	96,973	261,258	14,718,000
Puerto Rico	2,000	64,978	0	66,978	790,000
Rhode Island	926	1,412	4,146	6,484	229,000
South Carolina	3,000	94,824	169,894	267,718	42,389,000
South Dakota	12,000	18,786	46,689	77,475	1,100,000
Tennessee	3,000	36,490	70,035	109,525	17,570,000
Texas	3,000	16,952	36,523	56,475	4,068,000
Utah	3,014	10,545	7,531	21,090	153,000
Vermont	4,000	50,571	33,398	87,969	1,963,000
Virginia	3,000	79,994	145,955	228,949	30,308,000
Washington	0	209,227	219,733	428,960	7,202,000
West Virginia	4,800	187,125	43,146	235,071	5,048,000
Wisconsin	3,000	61,301	380,955	445,256	25,136,000
Wyoming	3,097	3,097	6,678	12,872	165,000
Total	229,090	3,461,430	3,762,481	7,453,002	535,429,000

TABLE 7.—*Planting stock available for forest and windbarrier planting on State and private lands, area planted or seeded, and acreage in need of planting*

State and Commonwealth	Planting stock shipped, fiscal year 1964			Area planted or seeded, fiscal year 1964 [1]	Plantable area as of January 1, 1953 [2]	Planting needs, 1958 [3]
	State nurseries	Other	Total			
	Thousands	*Thousands*	*Thousands*	*Acres*	*Acres*	*Acres*
Alabama	37,799	12,302	50,101	69,479	1,675,000	5,006,000
Alaska	0	0	0	0		
Arizona	0	0	0	228	18,000	40,000
Arkansas	5,199	0	5,199	11,889	1,408,000	1,405,000
California	2,630	914	3,544	10,110	3,357,000	3,001,000
Colorado	477	0	477	2,133	295,000	318,000
Connecticut	1,900	48	1,948	1,553	205,000	111,000
Delaware	748	0	748	743	34,000	11,000
Florida	66,307	22,419	88,726	134,543	4,859,000	7,033,000
Georgia	39,097	50,351	89,448	109,554	1,566,000	6,344,000
Hawaii	1,735	0	1,735	3,639		810,000
Idaho	521	0	521	791	265,000	691,000
Illinois	4,736	0	4,736	4,559	2,856,000	904,000
Indiana	3,590	0	3,590	4,583	1,290,000	330,000
Iowa	1,326	175	1,501	1,629	613,000	264,000
Kansas	0	806	806	2,724	915,000	230,000
Kentucky	12,972	1,319	14,291	18,123	1,500,000	2,004,000
Louisiana	32,193	6,190	38,383	52,860	1,139,000	2,379,000
Maine	3,292	2,500	5,792	3,342	472,000	1,171,000
Maryland	5,429	0	5,429	5,569	250,000	455,000
Massachusetts	388	70	458	1,146	114,000	254,000
Michigan	11,625	21,639	33,264	33,771	2,905,000	1,424,000
Minnesota	27,509	2,016	29,525	32,343	2,410,000	5,427,000
Mississippi	53,372	0	53,372	71,602	4,187,000	2,255,000
Missouri	10,242	0	10,242	7,680	1,267,000	3,200,000
Montana	1,078	1,903	2,981	3,012	214,000	931,000
Nebraska	0	636	636	6,528	968,000	87,000
Nevada	60	0	60	124	28,000	30,000
New Hampshire	1,351	0	1,351	1,320	309,000	464,000
New Jersey	653	0	653	631	93,000	819,000
New Mexico	0	0	0	313	97,000	245,000
New York	15,955	6,558	22,513	16,065	1,250,000	1,378,000
North Carolina	39,978	12,000	51,978	47,516	898,000	2,841,000
North Dakota	1,286	7,536	8,822	12,330	742,000	231,000
Ohio	13,393	0	13,393	13,510	729,000	616,000
Oklahoma	1,422	0	1,422	1,620	876,000	1,054,000
Oregon	20,297	3,886	24,183	72,247	969,000	2,008,000
Pennsylvania	15,937	35,000	50,937	42,005	1,080,000	869,000
Puerto Rico	822	0	822	550		105,000
Rhode Island	0	0	0	258	39,000	85,000
South Carolina	50,815	4,542	55,357	62,433	1,169,000	2,269,000
South Dakota	418	3,050	3,468	7,606	702,000	129,000
Tennessee	18,379	18,500	36,879	29,663	1,465,000	1,181,000
Texas	5,508	10,750	16,258	31,552	539,000	2,235,000
Utah	176	0	176	268	37,000	46,000
Vermont	1,963	0	1,963	2,018	99,000	274,000
Virginia	24,575	13,324	37,899	62,550	1,799,000	880,000
Washington	15,871	4,000	19,871	39,018	751,000	1,136,000
West Virginia	5,680	50	5,730	5,422	989,000	567,000
Wisconsin	25,488	7,024	32,512	31,331	2,685,000	5,172,000
Wyoming	0	0	0	482	95,000	103,000
Total	584,192	249,508	833,700	1,074,965	52,222,000	70,822,000

[1] Includes 141,196 acres directly seeded, primarily in Georgia, Florida, Louisiana, Oregon, and Washington. By estimate, 80 percent of these plantings and seedings are successful.

[2] Figures are those reported in "Timber Resources for America's Future." Alaska, Hawaii, and Puerto Rico were not included in the timber resource study.

[3] As reported in the National Inventory of Soil and Water Conservation Needs, 1962.

TABLE 8.—*Cooperative forest management accomplishments and expenditures, fiscal year 1964*

(U.S. Forest Service and State Foresters cooperating in 612 projects)

State and Commonwealth	Accomplishments				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*M bd. ft.*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	646	100,954	15,376	358,085	41,200	42,511	83,711
Alaska	8	768	0	0	15,000	31,904	46,904
Arkansas	1,117	87,358	2,059	37,648	43,875	54,745	98,620
California	1,775	347,295	73,567	1,690,204	39,700	94,224	133,924
Colorado	428	151,865	222	18,857	20,000	40,256	60,256
Connecticut	1,829	45,253	2,079	44,403	25,207	25,229	50,436
Delaware	93	2,084	1,428	42,200	5,195	5,196	10,391
Florida	4,635	1,959,214	34,404	1,123,182	100,000	218,059	318,059
Georgia	3,503	367,102	27,046	542,201	96,100	151,945	248,045
Hawaii	4	35,000	0	0	7,500	9,263	16,763
Idaho	464	23,808	202	1,270	16,493	16,494	32,987
Illinois	1,798	35,841	4,650	167,024	52,400	78,180	130,580
Indiana	1,579	51,279	3,735	173,379	46,210	46,210	92,420
Iowa	1,694	18,818	1,326	106,007	21,000	56,325	77,325
Kansas	478	10,997	272	27,220	24,000	24,976	48,976
Kentucky	3,692	68,662	8,028	262,128	77,275	212,364	289,639
Louisiana	283	48,858	4,431	59,733	37,175	57,594	94,769
Maine	1,567	88,598	25,433	358,861	62,500	105,347	167,847
Maryland	1,456	22,434	6,287	192,092	45,200	82,595	127,795
Massachusetts	2,410	44,796	22,174	324,935	23,200	39,943	63,143
Michigan	2,076	53,053	12,529	266,867	77,000	94,000	171,000
Minnesota	2,376	29,955	3,294	158,512	41,600	109,843	151,443
Mississippi	2,721	233,357	3,558	133,723	43,200	128,182	171,382
Missouri	2,516	198,097	18,405	376,678	76,900	175,238	252,138
Montana	280	20,917	1,228	19,457	14,110	14,111	28,221
Nebraska	617	5,193	306	30,593	15,000	18,316	33,316
Nevada	184	420	0	0	10,000	16,861	26,861
New Hampshire	2,815	104,746	11,157	254,461	33,980	50,121	84,101
New Jersey	1,051	28,465	3,480	101,876	29,300	49,442	78,742
New Mexico	63	209,375	10,200	95,600	20,000	24,335	44,335
New York	7,205	227,896	21,488	752,297	137,115	156,988	294,103
North Carolina	6,662	160,845	32,248	844,781	86,400	288,294	374,694
North Dakota	162	7,287	292	6,440	20,000	22,429	42,429
Ohio	2,856	70,413	9,444	368,324	77,600	98,679	176,279
Oklahoma	325	10,355	54	2,400	16,150	16,202	32,352
Oregon	2,839	78,393	6,553	285,940	30,777	30,777	61,554
Pennsylvania	2,519	40,126	7,715	205,889	89,400	128,979	218,379
Rhode Island	363	9,405	1,311	4,584	7,500	7,636	15,136
South Carolina	3,553	255,900	19,861	519,189	61,500	164,038	225,538
South Dakota	489	69,698	31,747	51,227	20,000	31,537	51,537
Tennessee	1,533	133,688	11,749	293,956	49,900	80,735	130,635
Texas	461	51,939	381	5,081	35,500	43,859	79,359
Utah	163	19,890	100	1,400	9,401	9,401	18,802
Vermont	3,380	56,429	12,511	460,199	55,500	106,905	162,405
Virginia	4,957	251,740	173,877	3,625,663	140,245	214,810	355,055
Washington	2,422	94,946	13,649	446,000	37,900	69,423	107,323
West Virginia	2,900	50,269	4,401	98,166	53,900	86,087	139,987
Wisconsin	8,122	156,405	24,004	642,116	158,700	311,791	470,491
Wyoming	0	0	0	0	3,499	3,499	6,998
Total, U.S.	95,069	6,140,186	668,261	15,580,848	2,251,307	3,945,878	6,197,185
Puerto Rico	1,994	492	13	1,383	16,800	31,871	48,671
Grand total	97,063	6,140,678	668,274	15,582,231	2,268,107	3,977,749	6,245,856

TABLE 9.—*Forest Service receipts and expenditures, all programs and sources, fiscal year 1964*

Item	Receipts	Expenditures
	Dollars	*Dollars*
National Forest programs:		
Cash receipts and appropriation expenditures	169,170,277	290,130,951
Cash receipts from National Forest land collected by and deposited to accounts of other agencies (Federal Power Commission, Department of Interior)	15,998,600	
Noncash income and expense (roads built by timber purchasers)	50,972,870	50,972,870
Total	236,141,747	341,103,821
Forest research programs:		
Forest research appropriations		25,197,176
Cooperative research work	915,723	977,735
Total	915,723	26,174,911
State and private forestry programs:		
Fire protection, tree distribution, and forest management cooperation		15,879,636
Soil bank program		1,702
Assistance to States for tree planting		997,730
Great Plains conservation program		17,967
Insect and disease control		1,699,767
Flood prevention and watershed protection		1,962,527
Forest fire prevention, "Smokey Bear"	53,586	26,169
Cooperator funds	2,525,352	2,142,241
Total	2,578,938	22,727,739
Work for other Government agencies and non-Government persons and firms:		
Insect and disease control (Interior Department lands)		109,919
Miscellaneous work for other Government agencies	3,135,984	4,769,036
Work performed for non-Government persons, firms, etc.—cooperative work	3,223,625	3,295,521
Reimbursed	834,344	834,344
Total	7,193,953	9,008,820
Total receipts and expenditures	246,830,361	399,015,291
Cash receipts distributed to States, counties, and Puerto Rico as directed by Congress (receipts of fiscal year 1963 except as indicated):		
Payments to States and Puerto Rico (act 5/23/08), National Forest fund		[1] 29,993,959
Payments to school funds, Arizona and New Mexico (act 6/20/10), National Forest fund		100,413
Payment to Minnesota (Cook, Lake, and St. Louis Counties) (Superior National Forest) (act of 6/22/48), National Forest fund		130,986
Payment to counties—National Grasslands and land utilization areas (act 7/22/37) (receipts of calendar year 1963)		455,379
Total		30,680,737
Internal equipment and supply services (working capital fund):		
Financed primarily by charges included above to Forest Service programs	24,624,740	24,170,961

[1] Does not include approximately $3,256,437 due counties from fiscal year 1963 receipts on National Forest O&C lands. This amount was included in total receipts of $4,341,916 transferred to Interior for distribution under act of Aug. 28, 1937 (50 Stat. 874), as amended.

NOTE: Expenditures are on an obligation basis except Working Capital Fund, which is on an accrual basis.

TABLE 10.—*Pest control accomplishment and costs, calendar year 1964*

OAK WILT CONTROL ACCOMPLISHMENTS

Ownership or management	Area surveyed	Trees treated	Funds expended		
			Federal	State	Total
National Forest:	*M Acres*	*Number*	*Dollars*	*Dollars*	*Dollars*
George Washington	902	80	2,719		2,719
Jefferson	13	3	220		220
Monongahela	800	29	924		924
Subtotal	1,715	112	3,863		3,863
State and private:					
Arkansas	8,000		1,919	3,898	5,817
Pennsylvania	7,036	4,176	11,626	34,877	46,503
Virginia	4,880	227	1,518	4,542	6,060
West Virginia	23,800	3,927	35,396	109,532	144,928
Subtotal	43,716	8,330	50,459	152,849	203,308
Grand total	45,431	8,442	54,322	152,849	207,171

BLISTER RUST CONTROL

Ownership or management	Control by ribes eradication						Control with antibiotics		
	Premaintenance work		Maintenance work		Ribes eradicated	Control established	Surveyed [2]	Acres treated	Trees treated
	Surveyed [1]	Treated	Surveyed [1]	Treated					
Federal:	*Acres*	*Acres*	*Acres*	*Acres*	*Number*	*Acres*	*Acres*	*Acres*	*Acres*
USDA, Forest Service	96,103	24,770	111,088	4,094	2,441,000	6,746	433,043	78,607	8,053,108
Department of the Interior:									
National Parks	107,990	19,220	16,194	3,018	906,000	14,333		1,880	71,400
Bureau of Land Management	5,049	910	4,047	112	92,000	1,521	896	66	4,175
Indian Reservations	1,246	314	14,809	2,427	73,000	314			4,650
Subtotal, Interior	114,285	20,444	35,050	5,557	1,071,000	16,168	896	1,946	80,225
Total, Federal	210,388	45,214	146,138	9,651	3,512,000	22,914	433,939	80,553	8,133,333
Non-Federal	417,837	84,853	1,545,474	43,078	3,568,000	67,061	227,535	21,720	2,599,910
Grand total	628,225	130,067	1,691,612	52,729	7,080,000	89,975	661,474	102,273	10,733,243

[1] Systematically inspected to locate area in need of treatment and to determine effectiveness of control.
[2] Inspected to determine where antibiotic treatment is feasible and where cost-benefit ratios are favorable.

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TABLE 10.—*Pest control accomplishments and costs, calendar year 1964*—Continued

Ownership or management	INSECTS							
	Bark beetles		Defoliators		Other insects			Costs [4] for all insects
	Trees [3] treated	Control costs	Area treated	Control costs	Area treated	Trees treated	Control costs	
	Number	*Dollars*	*Acres*	*Dollars*	*Acres*	*Number*	*Dollars*	*Dollars*
National Forest	1, 187, 166	3, 083, 198	609, 127	831, 638	172	22, 500	52, 799	[5] 3, 967, 635
State and private	176, 013	147, 381	266, 963	99, 111		190, 590	18, 910	265, 402
Total	1, 363, 179	3, 230, 579	876, 090	930, 749	172	213, 090	71, 709	4, 233, 037

[3] Includes infested trees, stumps, and cull logs.
[4] Exclusive of administrative and survey expenditures.
[5] Includes the Federal share of control costs on non-Federal lands.